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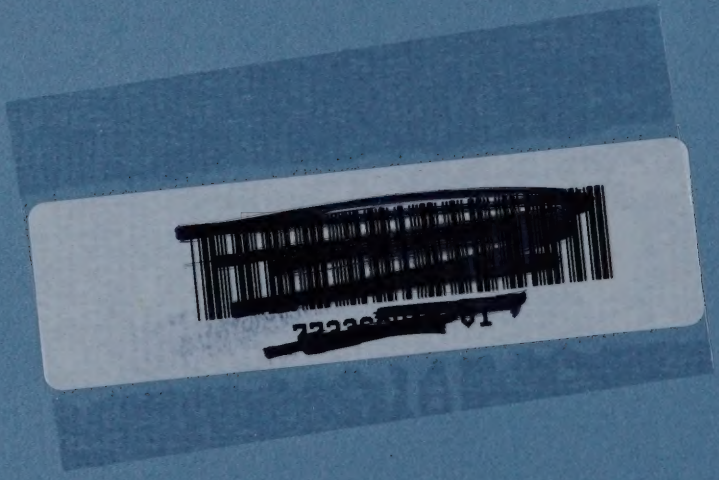

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Prepared for
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Building 50, Denver Federal Center
Denver, CO 80225

ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC.
696 Virginia Road, Concord, Massachusetts 01742

BLACK BUTTE EXISTING CLIMATE

The proposed Black Butte mining area is located about 20 miles east-southeast of Rock Springs at the southwestern edge of the Great Divide Basin. The general account of the temperature and precipitation patterns given in the regional analysis describes the climate in the vicinity of the Black Butte area.

Site-Specific Parameters

Sunshine

Since the Black Butte site is situated in the intermountain basin area, the annual percentage of possible sunshine is expected to be similar to the 72% recorded at Lander, Wyoming.

Winds

A study of the local climatology in the vicinity of the Jim Bridger Power Plant, located some 10 miles north of the Black Butte area, has been pursued privately by Crow and Hadley of WSSI (1971, 1972, 1973, 1974). Their analyses indicated that the predominant surface winds are from the southwest through west directions, as is the case at Rock Springs Airport (see Chapter 2 Regional Technical Report*). Additional surface wind statistics were compiled during 1975 near Point of Rocks, Wyoming, which is in the immediate vicinity of the proposed Black Butte mining area (Krablin and McNaughton 1977). Annually, winds are predominantly from the southwest through west-northwest with secondary peaks from the east-southeast and northeast directions. The annual average wind speed is about 6 mph, which is somewhat lower than that expected from the regional climatology. The lower average wind speed likely occurs from some sheltering effect produced by more irregular terrain in the vicinity of the local meteorological site than the airport at Rock Springs.

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*Available at the Rock Springs District BLM Office.

Atmospheric Temperature and Stability

Similar to the entire region, the Black Butte mining area is subject to large seasonal and diurnal temperature variations. Temperatures are expected to closely approximate those recorded at Rock Springs, which indicate mean monthly minima/maxima of 10°F/29°F in January and 50°F/84°F in July. Temperature extremes should range from about -29 to 97°F. Point of Rocks, Wyoming recorded extremes of -26 and 89°F during 1975. The growing season is expected to be about 200 days per year.

Field studies around the Jim Bridger Power Plant have indicated that stable atmospheric conditions, associated with nocturnal temperature inversions, occur often in this area. In fact, out of a total sample of 96 field study days between September 1970 and August 1972, investigators found that 88% had surface-based inversions (Crow and Hadley 1972). During the period from September 1970 through May 1974, they determined that the median height of the maximum depths of 109 surface-based inversions was about 700 feet (Crow and Hadley 1974). Using a modified Turner stability classification scheme and a one-year data base period, they found that slightly unstable atmospheric conditions occurred about 12% of the time annually. Neutral and stable conditions were found to occur 51% and 37% of the time, respectively.

Precipitation

Annual average precipitation during 1975 was 9 inches at Point of Rocks, which is typical of this area as indicated by the climatological value of 8.5 inches recorded at Rock Springs. A significant portion of the precipitation occurs during the spring and early summer months and results primarily from convective shower activity. Annual average snowfall should be around 30 to 40 inches.

Evapotranspiration

An annual soil moisture deficit of about 13 inches, as noted for Rock Springs in the regional analysis, should be characteristic of the Black Butte mining area. The growing season roughly coincides with the period of high soil moisture deficit.

Severe Weather Events

The number of thunderstorm and hail days are expected to reflect the regional values of about 30 and 3 days, respectively. The likelihood of tornadoes occurring is very low in this area.

Future Climate

It is not anticipated that the local climatology will change over the next fifteen years.

BLACK BUTTE EXISTING AIR QUALITY

The present air quality in the vicinity of the proposed Black Butte Mine should have a rural character. Therefore, the existing TSP levels in this area should range from 10 to 20 $\mu g/m^3$ annually and between 25 to 50 $\mu g/m^3$ for a 24-hour averaging period, or one-third or less than the appropriate Wyoming standards. The TSP sampler A-13 is situated in a rural area in close proximity to the proposed Black Butte site. An annual mean TSP concentration of 13 $\mu g/m^3$ was recorded at A-13 during 1975 with a maximum 24-hour TSP concentration of 43 $\mu g/m^3$. Based on five years of visual observations recorded at Rock Springs, an average background visual range in the vicinity of Black Butte should be about 40 miles.

Concentrations of SO_2 around Black Butte should also reflect its rural setting; i.e., levels less than 5 $\mu g/m^3$ on an annual basis and less than 25 $\mu g/m^3$ for a daily averaging period. Thus, the magnitude of these concentrations should be only about 10% of the appropriate state standards. In addition, annual NO_2 concentrations should be less than 10 $\mu g/m^3$ or again only about 10% of the state standards.

Future Environment of Black Butte Without the Proposed Action

If the proposed mining does not occur, it is anticipated that future regional TSP, SO_2, and NO_2 levels will be similar to currently monitored concentrations through 1990.

The expansion of the Jim Bridger Power Plant, however, may have a localized effect on air quality near the proposed Black Butte mine site; but this will be minimal. Although the expanded facility is expected to increase TSP emissions by 325 pounds per hour (29%) and NO_x emissions by 7,280 pounds per hour (25%), the addition of scrubbers will reduce overall SO_2 levels 34%. Ambient air concentrations should not change appreciably at the proposed mine site. Figures SC2-3 and SC2-4 indicate the magnitude and spatial distribution of the estimated future TSP levels in the vicinity of the Black Butte mine site.

Future visibility at this location would be similar to the existing visibility.

BLACK BUTTE AIR QUALITY IMPACTS

Emissions from the Proposed Mine

Particulate emissions from individual mining activities were calculated using emission factors developed in recent studies of fugitive dust sources from mining (EPA 1977; PEDCo 1976). These factors require estimates of coal production rates, overburden removal, haulage distances, employee access distances, vehicular speeds, and disturbed acreage. In addition, some of the factors require correction for soil silt content and climatic conditions. Estimates of operational parameters were obtained from the mining plan and from personal communications with mining engineers. Soil silt content was determined through consultation with the U.S. Department of Agriculture and the BLM. Climatic factors were estimated from local and regional climatological surveys. All formulas and data used in the emission calculations as well as inherent uncertainties are given in Chapter 4 of the Regional Technical Report.* Emission estimates for the different source activities with the mine at full operation are given in Table BB3-1 for 1980, 1985, 1990, and end of mine life (EOML).

The emissions burden projections presented in Table BB3-1 represent a conservative (upper bound) assessment of the impact of the proposed mine. This conservatism assumes that minimal dust controls would be applied to each mine activity. Therefore, to indicate the range of TSP impact that might be expected from variations in operating practices, emission burdens were also estimated for a more probable situation, where more stringent measures would be implemented for wind erosion control at the surface mines. These control measures are to be regarded as measures that may eventually be implemented by the mines (not mitigative measures).

For the contribution of wind erosion from unreclaimed and partially reclaimed land, the most probable situation would be represented by mulching and furrowing in the Spring, followed by Fall planting. Note that the projected emissions (Table BB3-1) were based on the assumption that mulching and planting would be performed in the Fall in a one-step operation. Surface roughness impediments to erosion (furrowing), moreover, were neglected in that analysis.

Results of the most probable analysis are presented in Table BB3-2. The slight variations among the factors that account for the emissions reduction achieved by Spring furrowing and mulching (versus Fall

*Available at the Rock Springs District BLM Office.

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TABLE BB3-1

BLACK BUTTE PARTICULATE EMISSIONS

	TSP (Tons per Year)			
	1980	1985	1990	EOML
Overburden Removal	1,121	1,435	960	4,800
Ore Loading	270	330	315	165
Truck Dumping	54	66	63	33
Train Loading	5.4	6.6	6.3	3.4
Conveying	27	33	32	16
Coal Storage	1.5	1.8	1.7	0.9
Crushing (Primary)	2.7	3.3	3.2	1.6
Crushing (Secondary)	8.6	10.6	10.1	5.3
Employee Access Roads	43	37	37	37
Haul Roads (Coal)	357	437	417	219
Haul Roads (Overburden)	0	0	0	0
Haul Road Repair	56	56	56	56
Dozers (Overburden Dumps)	224	224	224	224
Wind Erosion	1,020	2,111	1,861	1,467
Totals	3,190	4,751	3,986	7,028

TABLE BB3-2

MOST PROBABLE PARTICULATE EMISSIONS ESTIMATES FOR BLACK BUTTE

Year	Total Projected Emissions from Table BB3-1 (tons per year)	Reduction of Wind Erosion Emissions for Spring Mulching and Furrowing		Probable Emissions (tons per year)	Overall Percent Reduction from Projected Emissions
		Reduction Factor*	Emissions Reduction (tons per year)		
1980	3,190	0.80	816	2,374	26
1985	4,751	0.80	1,689	3,062	36
1990	3,986	0.80	1,489	2,497	37
EOML	7,028	0.80	1,174	5,854	17

*Percent reduction = 100 x (reduction factor); furrowing factor K = 0.6, 2,000 pounds per acre of mulch assumed to be applied on April 15 of the analysis year.

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mulching and no furrowing) result from differences in predominant soil types, climatic factors, and reclamation schedules among the four surface mines.

From the final column of the table, it is apparent that, during the analysis years representing the more typical levels of coal production and mine operation (1985 and 1990), the "most probable" estimates are 36 to 37% less than the more conservative "projected emissions" for the Black Butte mine. The lack of reliability of the most recently published fugitive dust emission factors for coal mines (EPA 1977) and the variability of such factors may be at least as great as the actual range of emissions implied by the figures in Table BB3-2.

Impact on Air Quality

To assess the impact of the mine on the atmospheric environment, estimates must be made of the ambient suspended particulate (SP) concentrations resulting from the mine emissions. To accomplish this, an atmospheric diffusion model has been applied to the mine site. The effect of local emissions is considered in the model both over a long period of time (annual average) and for short-duration exposures (daily averages). All of the emissions from the mine have been added to represent a single source originating across the entire mining area. This area source is considered to be the annual disturbed acreage for modeling of annual averages and 25 acres for modeling of daily averages. This is a reasonable representation considering the wide variations in individual emission points during mining operations. However, for some mines more than 25 acres may be active during any particular 24-hour period. Increasing the size of the area source as much as tenfold would serve to decrease predicted SP concentrations within approximately 1 mile of the mine site but would have little effect further downwind.

Meteorological input to annual average computations consisted of a stability wind rose derived from five years of observations at Rock Springs. Concentrations were calculated for 480 possible weather conditions and weighted by their frequency over a year. The worst-case wind direction was identified as southwest due to its high frequency of lower wind speeds that result in high ground-level concentrations.

To model worst-case 24-hour concentrations, it was assumed that a wind speed of 4 miles per hour (mph) and a stable atmosphere persisted for 12 hours, followed by a wind speed of 4 mph and a neutral atmosphere persisting for 8 hours, under a west-southwest wind for the 20-hour period. No mine impact was assumed for the other 4 hours. Such

conditions were derived from five years (1960 to 1964) of Rock Springs persistence data and represent worst-case meteorology for 24-hour modeling analyses.

Prior to evaluation of the simulated mine results, the reader is reminded of the serious limitations inherent in the state-of-the-art emission factors as well as the uncertainties associated with the modeling of fugitive dust emissions. A complete description of the modeling analysis and inherent uncertainties is presented in Chapter 4 of the Regional Technical Report.

Figures BB3-1 through BB3-4 show the mine-related SP concentrations for worst-case annual and 24-hour averages predicted by the model. Concentrations are shown to decrease rapidly with distance. Annual 24-hour mine-related concentrations decrease to 10% of maximum values at 3 to 4.5 miles and 1.5 to 2 miles downwind of the mine, respectively.

The worst-case SP concentrations shown in Figures BB3-1 through BB3-4 may be scaled to most probable SP levels by multiplying each worst-case concentration by the ratio of most probable emissions to worst-case emissions. For example, using the overall percent reduction from projected worst-case emissions (hence concentrations) of 17% for EOML in Table BB3-2, the worst-case annual concentration of 80 $\mu g/m^3$ and 24-hour concentration of 860 $\mu g/m^3$ at a receptor located 2 miles from the mine would decrease to 66 $\mu g/m^3$ and 714 $\mu g/m^3$, respectively. The decrease in mine-related concentrations implies that projected concentrations greater than the standards for the most probable emissions would not occur as far downwind of the mine as worst-case emissions.

When annual average background particulate values of 17 $\mu g/m^3$ for 1980 and 18 $\mu g/m^3$ for all other years (see Chapter 4 Regional Technical Report for how they were determined) are added to projected mine-related contributions, total levels greater than the annual 75 $\mu g/m^3$ NAAQS are predicted within 1.5, 2, 2 and 2.5 miles of the mine; and total TSP concentrations greater than the Wyoming 60 $\mu g/m^3$ standard are predicted within 2, 2.5, 2.5, and 3 miles of the mine for the years 1980, 1985, 1990, and EOML, respectively. Background concentrations are projected to contribute 70% to total TSP levels at 5.5 to 9 miles and 18 to about 25 miles from the mine for annual and 24-hour averaging periods, respectively.

If projected mine-related 24-hour SP values and background concentrations of 35 $\mu g/m^3$ are combined, concentrations greater than the 24-hour primary NAAQS of 260 $\mu g/m^3$ are predicted within 3, 4, 3.5, and 5 miles; and concentrations greater than the Wyoming standard of 150 $\mu g/m^3$ are predicted within 4.5, 6, 5, and 8 miles of the mine for the years 1980, 1985, 1990, and EOML, respectively.

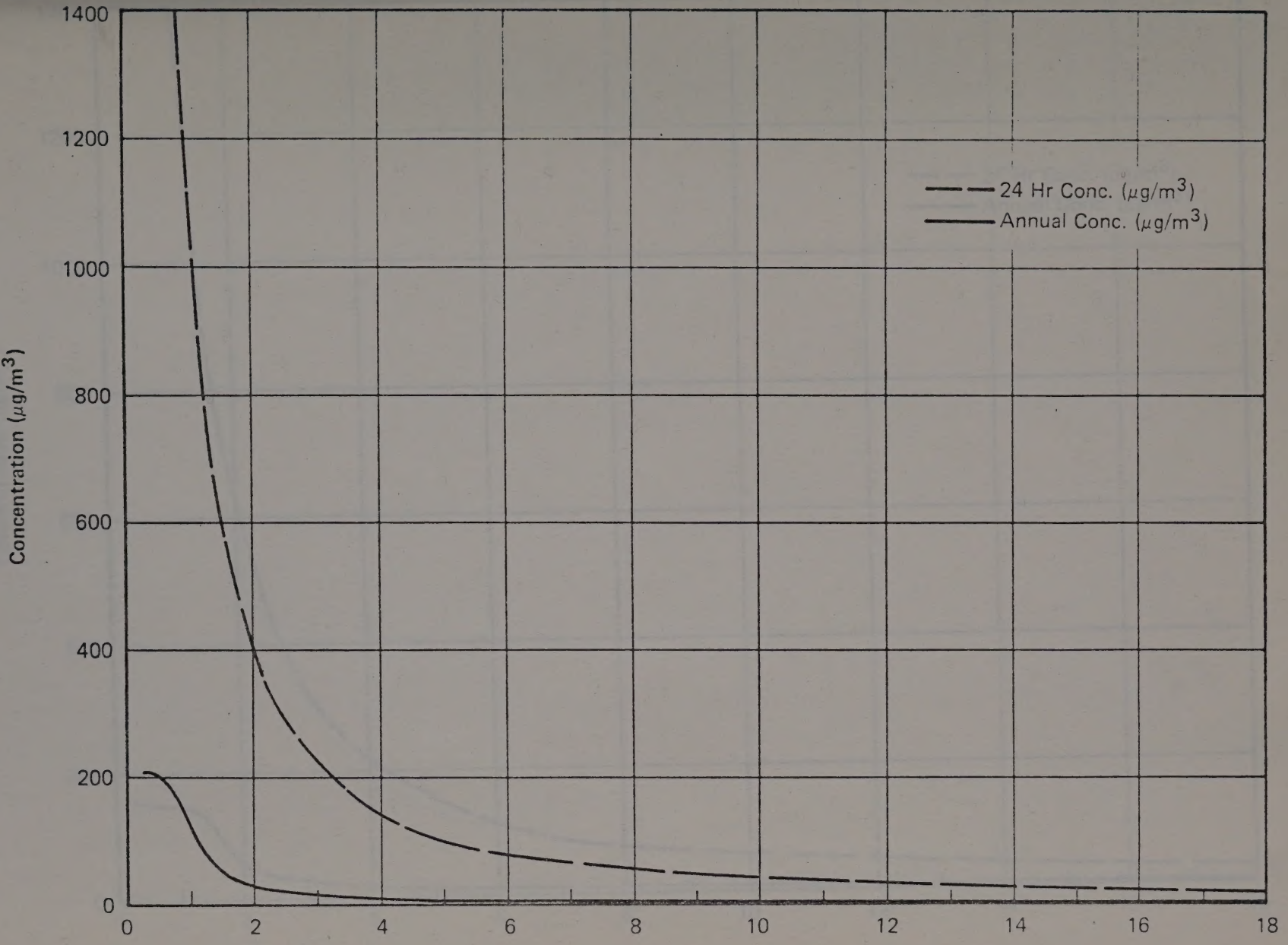
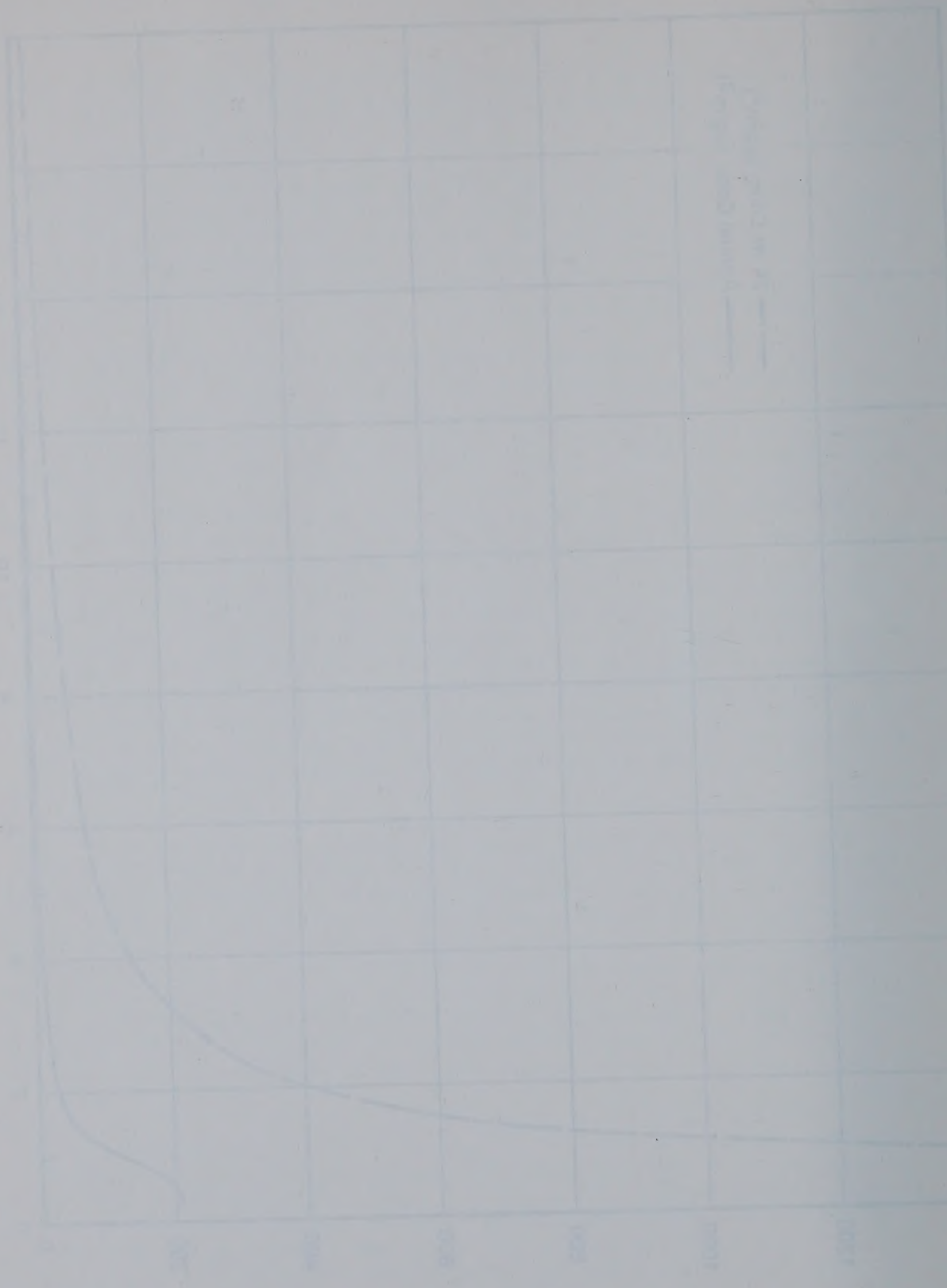


Figure BB3-1

1980 Black Butte SP Concentrations



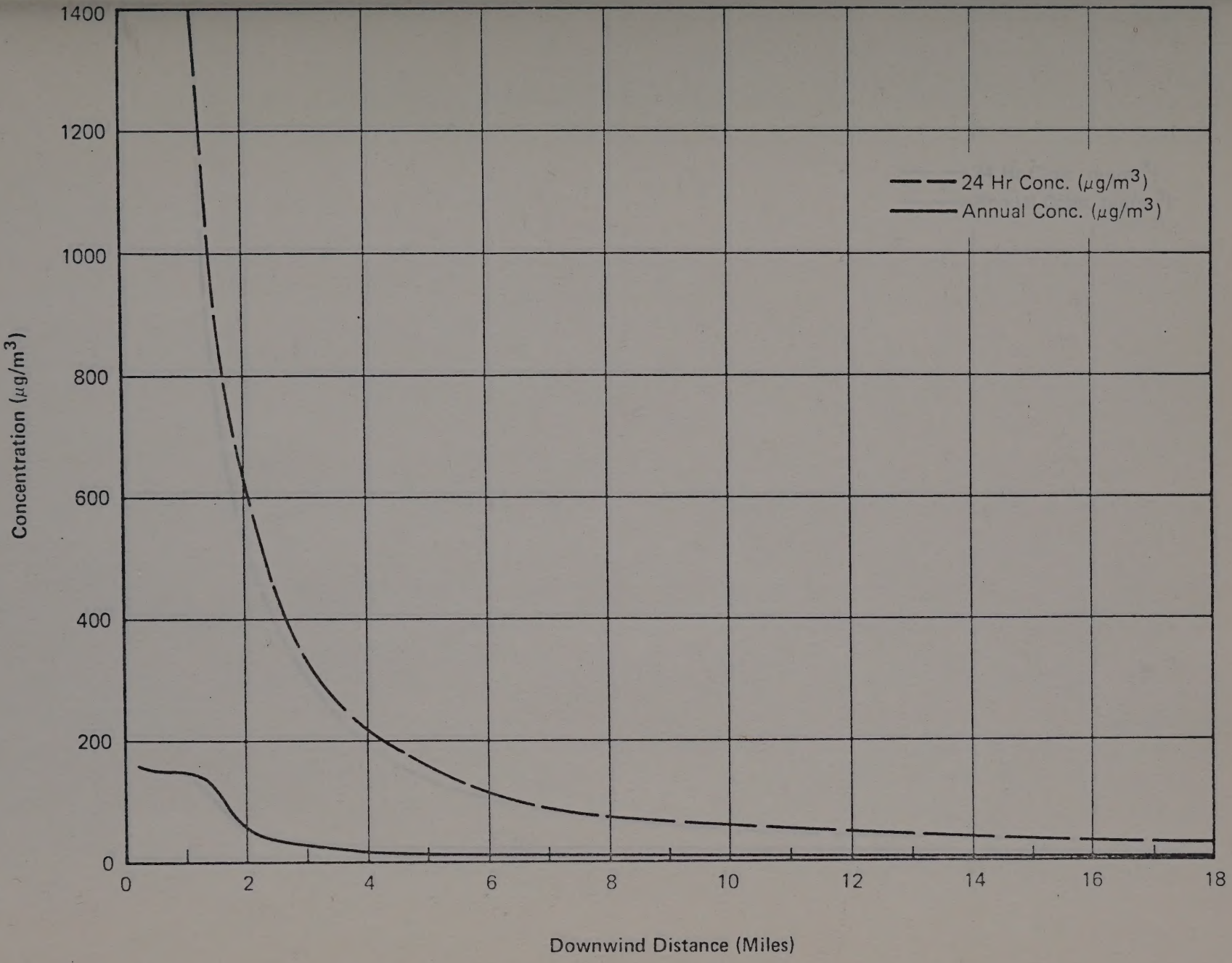


Figure BB3-2

1985 Black Butte SP Concentrations

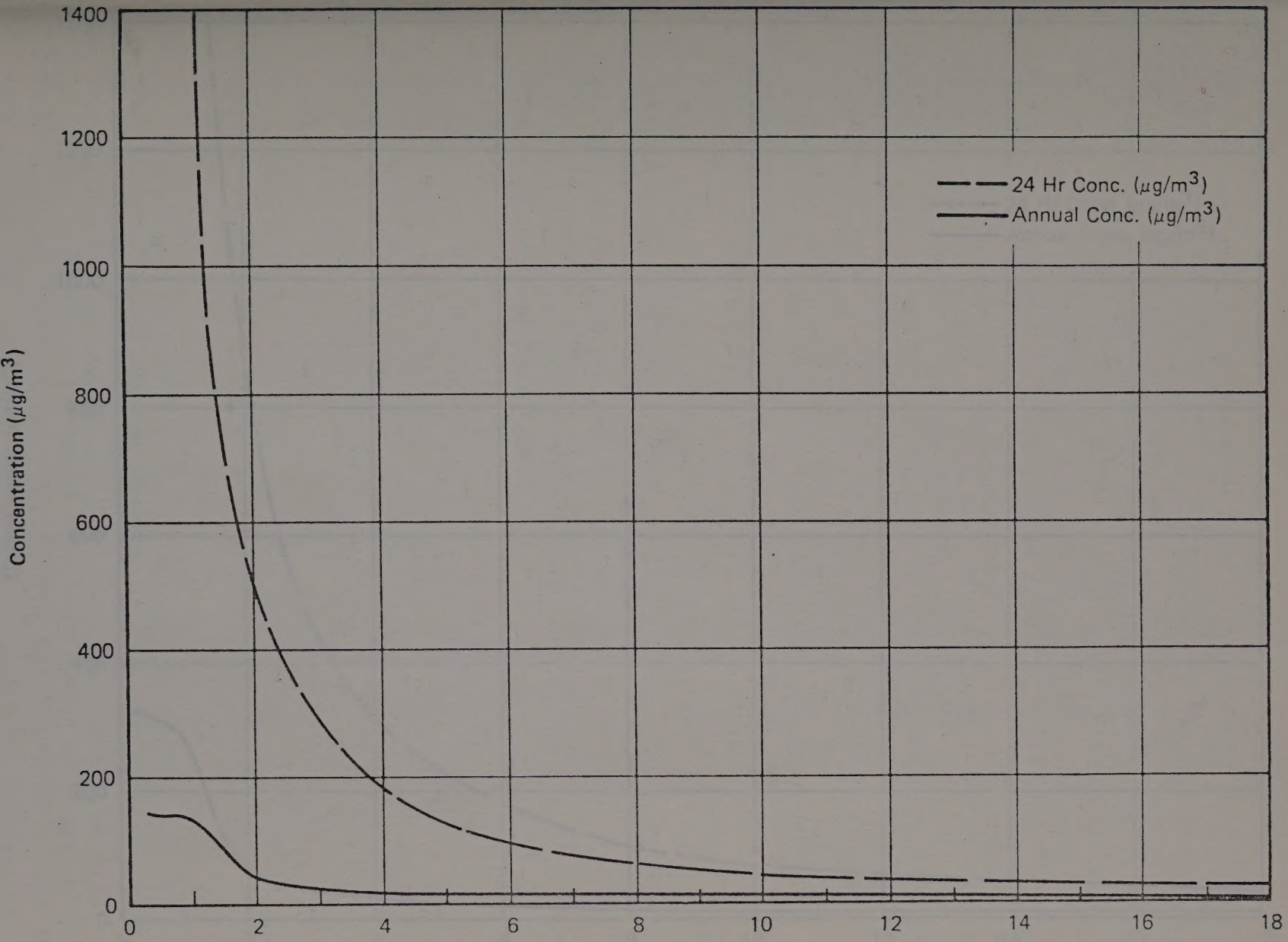


Figure BB3-3

1990 Black Butte SP Concentrations

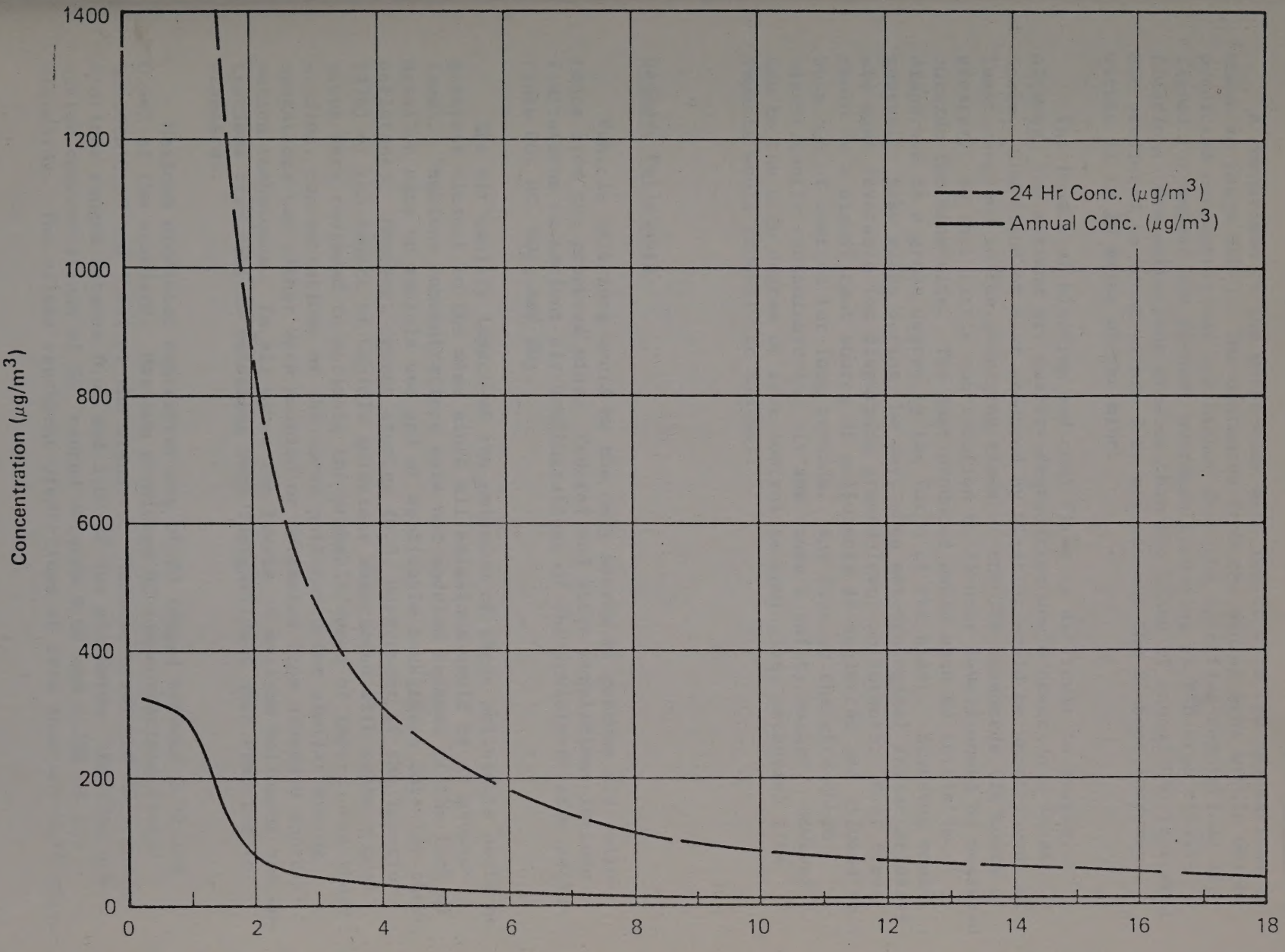


Figure BB3-4

EOML Black Butte SP Concentrations

A comparison of the worst-case mine impact with PSD regulations is shown in Table BB3-3. The distances from the mining area within which predicted concentrations are higher than the specified regulations are listed for annual and 24-hour averages according to PSD area classification. Concentrations greater than the Class II annual PSD increment are predicted to occur within 3 to 6 miles and the 24-hour increment within 11 to 20 miles of the mine.

The impact of blasting and coal fires is difficult to assess, although the maximum air quality degradation would occur on a local scale. The cloud of dust produced by blasting would be short-lived, at least compared to the averaging times of the TSP standards (24 hours or greater), so that little contribution to 24-hour levels would be measured outside the mine site. The dust produced would also be initially dispersed to a great degree by the force of the blast. Blasting would generally take place during the day, when meteorological characteristics are most favorable for dispersing ground-level pollutants. Coal fires could be a significant source of pollutants if neglected and allowed to burn out of control for long periods. Any fire on the site could significantly contaminate the air and cause a safety hazard. However, due to the high degree of fire control technologies, potential fire impacts would probably be minimal.

Gaseous Pollutants

Vehicle emissions would be the only source of gaseous air pollutants from the proposed mine. Federal and state regulations include limitations on ambient air concentrations of the vehicle-related pollutants CO, HC, NO_2, and SO_2.

The air quality impact of the emission of these pollutants would be greatest closest to the mine since all emissions would be at ground-level. Ambient concentrations were not modeled because of the lack of detailed data on vehicle use and of applicable background data for these pollutants. However, recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines were reviewed to estimate the probable range of impact. In these studies, concentrations of the above pollutants for similar mining operations had either been modeled or estimated from standard approximation techniques. In all cases the levels of maximum pollutant concentrations from vehicle emissions were insignificant when compared to standards.

Maximum predicted concentrations of CO ranged between 0.02 and 0.44% of the standard. Maximum predicted HC concentrations ranged between 0.88 and 3.44% of the standard. Maximum predicted NO_2 concentrations ranged between 0.60 and 3.0% of the standards. Maximum predicted concentrations of SO_2 ranged between 0.02 and 0.33% of the standards. The values represent predictions at less than one-half mile

TABLE BB3-3

COMPARISON OF WORST-CASE MODEL PREDICTIONS WITH PSD REGULATIONS

Area Classification	Annual					24-Hour			
	Increment ($\mu g/m^3$)	Distance Within Which Predicted Concentrations are Greater than the Increment (miles)				Increment ($\mu g/m^3$)	Distance Within Which Predicted Concentrations are Greater than the Increment (miles)			
		1980	1985	1990	EOML		1980	1985	1990	EOML
II	19	3	4	4	6	37	11	15.5	12.5	20

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from the mines. Predictions were significantly less at further distances from the mines. Assuming similar vehicle activity for all western coal mines, the impact of vehicle emissions on ambient concentrations of gaseous pollutants would be minimal and insignificant compared to their respective standards.

Visibility

The ability of an observer to discern distant objects will be constrained by the capacity of the intervening atmosphere to absorb and scatter visible light within one's field of view. These atmospheric extinction properties and their corresponding effect on visibility degradation depend, in a complicated manner, on the optical nature of ambient molecules, aerosols, and particulates within the line of sight. Additional anthropogenic sources of particulates, such as those attributable to fugitive dust emissions, will reduce visibility in the immediate source area. Precise evaluation of the degree of visibility degradation requires a knowledge of several parameters, such as the characteristic particulate number size distribution and the optical properties of particulates within each size range. Such data are generally not available. However, by employing reasonable assumptions, an estimate of the visibility impact may be derived using TSP concentrations.

The hypothetical observer is positioned such that one's line of sight is perpendicular to the average wind direction across the plume within a 22.5° sector. For each year considered, the ERTAQ-simulated downwind SP concentrations ($\mu g/m^3$) (given in Figures BB3-1 through BB3-4) are partitioned by mass into both coal and soil fractions based on the annual emissions summary for each mining process. An appropriate number size distribution is assumed for windblown particulates normalized per unit mass concentration. Sixty percent of the TSP is assumed to populate the optically significant size range. Contributions to the total plume visibility degradation are computed for each fraction using its optical properties and scaling normalized results by the TSP concentrations. Results are presented for each year assuming background visibilities of both 40 miles and 7 miles, the latter characteristic of weather induced visibility degradation. A complete technical description is given in Chapter 4 of the Regional Technical Report.

Using this technique, visibilities are computed downwind from the source. Results for worst-case 24-hour SP concentrations for the years 1980, 1985, 1990, and EOML are shown in Table BB3-4. Also given are the mass fractions of the total TSP for coal and soil for each year. For 1980 the visibility of an observer at 1 mile downwind would be approximately 38.4 miles assuming a background visibility of 40 miles. In general, visibility will increase with downwind distance from the mine. At 5 miles downwind the visibility will be 39.4 miles and at 10 miles it will reach 39.5 miles. The corresponding values, assuming a background visibility of 7 miles, are 6.7 miles, 6.9 miles, and 6.9 miles, respectively. Additional years are given in the table.

TABLE BB3-4

ACROSS PLUME VISIBILITY DEGRADATION FOR THE PROPOSED BLACK BUTTE MINE

Year	Mass Fraction		Visibility Downwind					
			Background 40 Miles			Background 7 Miles		
	Coal	Soil	1 Mile	5 Miles	10 Miles	1 Mile	5 Miles	10 Miles
1980	0.12	0.88	38.4	39.4	39.5	6.7	6.9	6.9
1985	0.10	0.90	37.7	39.0	39.3	6.6	6.8	6.9
1990	0.12	0.88	38.8	39.2	39.4	6.8	6.9	6.9
EOML	0.03	0.97	36.6	38.6	38.9	6.4	6.7	6.8

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AIR QUALITY MITIGATING MEASURES NOT INCLUDED IN THE PROPOSED ACTION

The measures that will be taken to reduce the impact of the proposed mining activities must be enforceable under state and federal laws and regulations. Appropriate laws include the Clean Air Act of 1970 (U.S. Congress 1970), the Clean Air Act Amendments of 1977, (U.S. Congress 1977), the Wyoming Air Quality Standards and Regulations (Wyoming Statutes 1972), and the Surface Mining Control and Reclamation Act of 1977 (PL 95-87).

Measures Required by Federal Agencies

Office of Surface Mining

Before approval of mining and reclamation plans is granted, the mine plan must demonstrate performance standards that ensure removing the amount maximum of the coal resource; restoring the condition of the mined land; stabilizing surface areas to control erosion and, hence, emissions of fugitive dust; removing topsoil; restoring topsoil; and establishing a permanent vegetative cover for post-mining land-use.

Bureau of Land Management (BLM) and U.S. Geological Survey (USGS)

Enforceable procedures have been provided to ensure that adequate measures are taken during exploration of surface mining of federal coal to avoid, minimize, or correct damages to the environment, including air. Also implemented by the BLM and USGS are procedures to conduct leasing and subsequent management of federal coal, as well as regulations governing operations for discovering, testing, developing, mining, and preparing federal coal.

Environmental Protection Agency (EPA)

Mandated by the Clean Air Act of 1970, Wyoming is responsible for ensuring air quality within its borders and for specifying achievement and maintenance strategies. While the ultimate authority for enforcing the air pollution regulations rests with the EPA, this authority is only exercised when enforcement by the state environmental quality departments fails.

State and Local Agencies

Wyoming Department of Environmental Quality (DEQ)

To ensure that the ambient air quality standards will not be exceeded, the Wyoming DEQ must approve the construction and/or modification and the operation of any facility that will have an impact on air quality (Section 21, Wyoming Statutes 1972). The approval process involves an evaluation of the expected impact on the ambient air quality. The Wyoming DEQ, Division of Air Quality, also generally requires the establishment of a monitoring program to gather data concerning the ambient air quality as a result of the operation of the new or modified facility.

The Air Quality Division is legally required to ensure maintenance of the Air Quality Standards; and, therefore, they are required to ensure that mitigating measures are practiced. This is done as a matter of course through the permit and enforcement procedures. For instance, if the ambient monitoring system reveals that fugitive dust is causing excessive ambient TSP concentrations, the Wyoming DEQ could require any of the following control measures (Section 14, Wyoming Statutes 1972):

"The emission of fugitive dust shall be limited by all persons handling, transporting, or storing any material to prevent unnecessary amounts of particulate matter from becoming airborne to the extent that ambient air standards described in these regulations are exceeded. Control measures described as follows or any equivalent method shall be considered appropriate for such control.

1) use, where possible, of water or chemicals for control of dust in the demolition of existing buildings, or structures, construction operations, the grading of roads or the clearing of land;

2) application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which can give rise to airborne dusts;

3) installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials; adequate containment methods shall be employed during sandblasting or other similar operations;

4) covering, at all times when in motion, open-bodied trucks, transporting materials likely to give rise to airborne dust;

5) conduct of agricultural practices such as tilling of land, application of fertilizers, etcetera, in such a manner as to prevent dust from becoming airborne;

6) the paving of roadways and their maintenance in a clear condition;

7) the prompt removal of earth or other material from paved streets onto which earth or other material has been transported by trucking or earth moving equipment, erosion by water, or other means."

These control measures are further enforced by the Clean Air Act Amendments of 1977. The Prevention of Significant Deterioration regulations (PSD) as mandated by the Amendments require specific control measures be implemented at a new facility or on modification of an existing source. If this facility is located in an area of air quality standard nonattainment (NA) status or is predicted to significantly impact an NA area, even more stringent regulations and control procedures apply. For example, if the new source will operate in an area of recorded TSP violations, through the permitting process, implementation of a monitoring program, Best Available Control Technology, Lowest Achievable Emission Rates, and/or the Offset Policy may apply. The Offset Policy mandates that emissions from existing sources in the region must be reduced in an amount more than sufficient to offset emissions from the new sources.

Applicant Committed Measures

There are no air quality or climate mitigative measures committed subsequent to the filed mine plan. Since federal and state regulations (mining and reclamation, emissions, and air quality maintenance) require that best available control measures be included in the mine plans, they have been considered in the impact analysis (Chapter 3).

Monitoring and Research Programs

To develop a base for future mine impact analyses and ascertain attainment or nonattainment of Air Quality Standards, the operators would be required to provide a monitoring program. This would be for the purpose of determining both background concentration levels and total ambient levels (background plus mining impact). Therefore, the monitoring program would measure TSP levels both in the predominant upwind and downwind directions. As reclamation is accomplished, the compliance officers (state and federal) would conduct periodic inspections of mining areas to ensure reclamation is accomplished in accordance with an approved reclamation plan.

UNAVOIDABLE ADVERSE IMPACTS FOR BLACK BUTTE

For the Black Butte mine, no optional mitigative measures are proposed. All measures proposed in the mining plans are already included in the analysis. Therefore, all reductions in concentrations associated with mitigation have already been considered in the impacts reported in Chapter 3. Unavoidable adverse impacts are then equivalent to impacts discussed in Chapter 3.

Impacts on Air Quality

When annual average background particulate values of 17 $\mu g/m^3$ for 1980 and 18 $\mu g/m^3$ for all other years (see Chapter 4 of the Regional Technical Report* for how they were determined) are added to projected mine-related contributions, the annual primary NAAQS of 75 $\mu g/m^3$ is predicted to be exceeded (in the worst case) within 1.5, 2, 2, and 2.5 miles of the active site; and the annual Wyoming standard of 60 $\mu g/m^3$ is predicted to be exceeded within 2, 2.5, 2.5, and 3 miles of the active site for the years 1980, 1985, 1990, and EOML, respectively (see Table BB5-1).

If projected mine-related 24-hour SP values and background concentrations of 35 $\mu g/m^3$ are combined, the 24-hour primary NAAQS of 260 $\mu g/m^3$ is predicted to be exceeded within 3, 4, 3.5, and 5 miles of the active site; and the Wyoming standard of 150 $\mu g/m^3$ is predicted to be exceeded within 4.5, 6, 5, and 8 miles of the active site for the years 1980, 1985, 1990, and EOML, respectively. (These projections are based on worst-case meteorological conditions.)

A comparison of the worst-case mine impact with PSD regulations is shown in Table BB5-2. The distances from the mining area within which the specified regulations are predicted to be exceeded are listed for annual and 24-hour averages according to PSD area classification.

The predicted annual and 24-hour TSP concentrations discussed above and presented in Tables BB5-1 and BB5-2 are worst-case mine impacts. In addition, twenty-four hour impacts are based on worst-case meteorological conditions. Annual impacts assume a mining and reclamation schedule such that for approximately nine months of the year there is unreclaimed land subject to wind erosion. The "most probable" levels of emissions have been calculated based on these factors (see Chapter 3 for a more detailed discussion). The most probable emissions for the Black Butte mine in 1990 may be as little as 63% of the worst-case emissions.

In addition to the sources of fugitive dust already listed, two other potential sources of significant particulate emissions are associated with the Black Butte mine: blasting and coal fires. The

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TABLE BB5-1

DISTANCES FROM ACTIVE MINE SITE WITHIN WHICH AMBIENT AIR QUALITY STANDARDS FOR TSP ARE PREDICTED TO BE EXCEEDED

Averaging Time	Standard ($\mu g/m^3$)	Year			
		1980	1985	1990	EOML
24-hour	150*	4.5 miles	6 miles	5 miles	8 miles
	260**	3 miles	4 miles	3.5 miles	5 miles
Annual	60*	2 miles	2.5 miles	2.5 miles	3 miles
	75**	1.5 miles	2 miles	2 miles	2.5 miles

*Wyoming
**NAAQS

TABLE BB5-2

DISTANCES FROM ACTIVE MINE SITE WITHIN WHICH
PSD REGULATIONS FOR TSP
ARE PREDICTED TO BE EXCEEDED

Averaging Time	Standard* ($\mu g/m^3$)	Year			
		1980	1985	1990	EOML
24-hour	37	11 miles	15.5 miles	12.5 miles	20 miles
Annual	19	3 miles	4 miles	4 miles	6 miles

*Area II classification

impact of these two sources is difficult to assess although the maximum air quality degradation would occur on a local scale. The cloud of dust produced by blasting would be short-lived, at least compared to the averaging times of the TSP standards (24 hours or greater), so that little contribution to 24-hour levels would be measured outside the mine site. Coal fires could occur in spite of mitigating measures taken to prevent them. If neglected and allowed to burn out of control for long periods, they could be a significant source of pollutants. Any fire on the site could significantly contaminate the air and cause a safety hazard. However, due to a high degree of fire control technologies, potential fire impacts would probably be minimal.

If reclamation fails because of a natural catastrophe and the area disturbed by mining operations is not revegetated, particulate emissions could be increased over all predicted emission levels presented in this report, although the magnitude of this increase is unknown.

Mine-related NO_x and SO_2 emissions are expected to be insignificant, as discussed in Chapter 4 of the Regional Statement Component; therefore, ambient pollutant concentrations have not been predicted.

Gaseous Pollutants

Recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines were reviewed to estimate the probable range of impact. Maximum predicted concentrations of CO ranged between 0.02 and 0.44% of the standard. Maximum predicted HC concentrations ranged between 0.88 and 3.44% of the standards. Maximum predicted NO_2 concentrations ranged between 0.60 and 3.0% of the standards. Maximum predicted concentrations of SO_2 ranged between 0.02 and 0.33% of the standards. The values represent predictions at less than one-half mile from the mines. Predictions were significantly less at further distances from the mines.

Visibility

For 1980, the visibility of an observer at 1 mile downwind would be approximately 38.4 miles, assuming a background visibility of 40 miles. In general, visibility will increase with downwind distance from the mine. At 5 miles downwind the visibility will be 39.4 miles, and at 10 miles it will reach 39.5 miles. The corresponding values, assuming a background visibility of 7 miles, are 6.7 miles, 6.9 miles, and 6.9 miles, respectively (see Table BB5-3).

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TABLE BB5-3

ACROSS PLUME VISIBILITY DEGRADATION FOR THE PROPOSED BLACK BUTTE MINE

Year	Visibility Downwind					
	Background 40 Miles			Background 7 Miles		
	1 Mile	5 Miles	10 Miles	1 Mile	5 Miles	10 Miles
1980	38.4	39.4	39.5	6.7	6.9	6.9
1985	37.7	39.0	39.3	6.6	6.8	6.9
1990	38.8	39.2	39.4	6.8	6.9	6.9
EOML	36.6	38.6	38.9	6.4	6.7	6.8

RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY FOR BLACK BUTTE

Short-term use of the environment (mining operations) will produce impacts that include generation of fugitive dust and gaseous pollutants (from vehicles) and a reduction in visibility.

The air pollution caused by the mine will be primarily a short-term phenomenon because most air quality impacts will cease when active mining and reclamation are completed. Short-term air quality impacts include fugitive dust generated by the mining activities, particulate emissions associated with blasting and coal fires, and reductions in visibility.

Air pollution from vehicle exhausts and fugitive dust emissions from access roads after the completion of mining will depend on the subsequent use of the land. Access to the property will have been established. Continued use of unpaved access roads could result in continuing emissions of fugitive dusts from wind erosion and gaseous pollutants from vehicle exhausts. If these impacts continue after EOML, they will be long-term impacts. Since subsequent land use is not known, the extent of these impacts cannot be quantified but is expected to be minimal. Minimal concentrations are anticipated because concentrations predicted during mine life based on traffic associated with mining operations is insignificant when compared to national standards. Traffic volume would have to increase significantly over that estimated at peak mining operations to substantially affect ambient concentrations in the future. Therefore, the short-term use of the natural resources (coal) is not expected to significantly affect long-term maintenance of air quality.

The proposed short-term use of the environment does not foreclose other additional long-term uses of the environment. That is, air quality will not be degraded after EOML, foreclosing the development of other industrial sources in the area (due to PSD allowable increments) or altering the air quality from its presently rural character.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES FOR BLACK BUTTE

Irreversible air quality impacts are those impacts that would continue even if the project were halted or completed. Most air quality impacts associated with the Black Butte mine will be reversed when the land is reclaimed and returned to an equivalent of the pre-existing vegetative cover and general contours. The only long-term air quality impacts anticipated are those resulting from continued use of unpaved access roads after the project has been completed or halted. Since use of these roads could be stopped by blocking access or reclaiming roadbeds, no irreversible air quality impacts are predicted.

Irreversible meteorological impacts are anticipated. Local, insignificant changes in the microclimatology of the area would result from the redistribution of the surface material at the mine. (See Chapter 2 of the Regional Technical Report*.) Changes in contours and surface characteristics would irreversibly alter the wind field and surface heating of the air. For example, the divergent or convergent patterns of the surface winds would change according to the changes in small-scale surface contours. Changes in the composition of topsoil and vegetation could alter the absorption and radiation of solar heat.

Irretrievable air quality impacts will occur. The loss of good air quality for the period of the project cannot be retrieved. During the life of the project, TSP standards may be exceeded and visibility reduced in the immediate vicinity of the project.

*Available at the Rock Springs District BLM Office.

LONG CANYON EXISTING CLIMATE

The proposed Long Canyon mining area is located about 20 miles north of Rock Springs at the northern edge of the North Baxter Basin. The general account of the temperature and precipitation patterns given in the regional analysis describes the climate in the vicinity of the Long Canyon area.

Site-Specific Parameters

Sunshine

Since the Long Canyon site is situated in the intermountain basin area, the annual percentage of possible sunshine is expected to be similar to the 72% recorded at Lander, Wyoming.

Winds

A study of the local climatology in the vicinity of the Jim Bridger Power Plant, located some 20 miles east of the Long Canyon area, has been pursued privately by Crow and Hadley of WSSI (1971, 1972, 1973, 1974). Their analyses have indicated that the predominant surface wind directions are from the southwest through west, as is the case at Rock Springs Airport (see Chapter 2 Regional Technical Report*).

Atmospheric Temperature and Stability

Similar to the entire ES region, the Long Canyon mining area is subject to large seasonal and diurnal temperature variations. Temperatures are expected to closely approximate those recorded at Rock Springs, which indicate mean monthly minima/maxima of 10°F/29°F in January and 50°F/84°F in July. Temperature extremes should range from about -29 to 97°F. Point of Rocks, Wyoming recorded extremes of -26 and 89°F during 1975.

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*Available at Rock Springs District BLM Office.

Field studies around the Jim Bridger Power Plant have indicated that stable atmospheric conditions, associated with nocturnal temperature inversions, occur often in this area. In fact, out of a total sample of 96 field study days between September 1970 and August 1972, investigators found that 88% had surface-based inversions (Crow and Hadley 1972). During the period from September 1970 through May 1974, they determined that the median height of the maximum depths of 109 surface-based inversions was about 700 feet (Crow and Hadley 1974). Using the modified Turner stability classification scheme and a one-year data base period, they found that slightly unstable atmospheric conditions occurred about 12% of the time annually. Neutral and stable conditions were found to occur 51% and 37% of the time, respectively.

Precipitation

Annual average precipitation should approximate the 8.5 inch climatological value recorded at Rock Springs. A significant portion of the precipitation occurs during the spring and early summer months and results primarily from convective shower activity. Annual average snowfall should be around 30 to 40 inches.

Severe Weather Events

The number of thunderstorm and hail days are expected to reflect the regional values of approximately 30 and 3 days, respectively. The likelihood of tornadoes occurring is very low in this area.

Future Climate

It is not anticipated that the local climatology will change over the next fifteen years.

LONG CANYON EXISTING AIR QUALITY

The present air quality in the vicinity of the proposed Long Canyon Mine should have a rural character. Therefore, existing TSP levels at this site should range from 10 to 20 $\mu g/m^3$ annually and between 20 to 50 $\mu g/m^3$ for a daily averaging period, or one-third or less than the appropriate Wyoming standards. Based on five years of visual observations recorded at Rock Springs, Wyoming, an average background visual range in the vicinity of Long Canyon should be about 40 miles.

Concentrations of SO_2 around Long Canyon should also reflect its rural setting; i.e., levels less than 5 $\mu g/m^3$ annually and less than 25 $\mu g/m^3$ for a daily averaging period. Thus, the magnitude of these concentrations should be only about 10% of the appropriate state standards. In addition, annual NO_2 concentrations should be less than 10 $\mu g/m^3$ or again only 10% of the state standard.

Future Environment of Long Canyon Without the Proposed Action

If the proposed mining does not occur, it is anticipated that future regional TSP, SO_2, and NO_2 levels will be similar to existing concentrations through 1990.

The expansion of the Jim Bridger Power Plant, however, may have a local effect on air quality near the proposed Long Canyon mine site, but this will be minimal. Although the expanded facility is expected to increase TSP emission by 325 pounds per hour (29%) and NO_x emissions by 7,280 pounds per hour (25%), the addition of scrubbers will reduce overall SO_2 levels 34%. Ambient air concentrations should not change appreciably at the proposed mine site. Figures SC2-3 and SC2-4 indicate the magnitude and spatial distribution of the estimated future TSP levels in the vicinity of the Long Canyon mine site.

Future visibility at this location would be similar to the existing visibility.

LONG CANYON AIR QUALITY IMPACTS

Emissions from the Proposed Mine

Particulate emissions from individual mining activities were calculated using emission factors developed in recent studies of fugitive dust sources from mining (EPA 1977; PEDCo 1976). These factors require estimates of coal production rates, employee access distances, and vehicular speeds. In addition, some of the factors require correction for soil silt content and climatic conditions. Estimates of operational parameters were obtained from the mining plan and from personal communications with mining engineers. Soil silt content was determined through consultation with the U.S. Department of Agriculture and the BLM. Climatic factors were estimated from local and regional climatological surveys. All formulas and data used in the emission calculations as well as inherent uncertainties are given in the Chapter 4 Regional Technical Report.* Emission estimates for the different source activities with the mine at full operation are given in Table LC3-1 for 1980, 1985, 1990, and end of mine life (EOML).

Impact on Air Quality

To assess the impact of the mine on the atmospheric environment, estimates must be made of the ambient suspended particulates (SP) concentrations resulting from the mine emissions. To accomplish this, an atmospheric diffusion model has been applied to the mine site. The effect of local emissions is considered in the model both over a long period of time (annual average) and for short-duration exposures (daily averages). All of the emissions from the mine have been added to represent a single source originating across the entire mining area. This area source is considered to be the annual disturbed acreage for modeling of annual averages and 25 acres for modeling of daily averages. This is a reasonable representation considering the wide variations in individual emission points during mining operations. However, for some mines more than 25 acres may be operationally active during any particular 24-hour period. Increasing the size of the area source as much as tenfold would serve to decrease predicted SP concentrations within approximately 1 mile of the mine site but would have little effect further downwind.

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TABLE LC3-1

LONG CANYON PARTICULATE EMISSIONS

	TSP (Tons per Year)			
	1980	1985	1990	EOML
Overburden Removal	0	0	0	0
Ore Loading	25	100	100	100
Truck Dumping	5	20	20	20
Train Loading	0.5	2	2	2
Conveying	2.5	10	10	10
Coal Storage	3.4	13.5	13.5	13.5
Crushing (Primary)	0.2	1	1	1
Crushing (Secondary)	0	0	0	0
Employee Access Roads	70.5	125	125	125
Haul Roads (Coal)	0	0	0	0
Haul Roads (Overburden)	0	0	0	0
Haul Road Repair	0	0	0	0
Dozers (Overburden Dumps)	0	0	0	0
Wind Erosion	135	135	135	135
Totals	242	406	406	406

Meteorological input to annual average computations consisted of a stability wind rose derived from five years of observations at Rock Springs. Concentrations were calculated for 480 possible weather conditions and weighted by their frequency over a year. The worst-case wind direction was identified as southwest due to its high frequency of lower wind speeds that result in high ground-level concentrations.

To model worst-case 24-hour concentrations, it was assumed that a wind speed of 4 miles per hour (mph) and a stable atmosphere persisted for 12 hours, followed by a wind speed of 4 mph and a neutral atmosphere persisting for 8 hours, under a west-southwest wind for the 20-hour period. No mine impact was assumed for the other 4 hours. Such conditions were derived from five years (1960 to 1964) of Rock Springs persistence data and represent worst-case meteorology for 24-hour modeling analyses.

Prior to evaluation of the simulated mine results, the reader is reminded of the serious limitations inherent in the state-of-the-art emission factors as well as the uncertainties associated with the modeling of fugitive dust emissions. A complete description of the modeling analysis and inherent uncertainties is presented in Chapter 4 of the Regional Technical Report.

Figures LC3-1 and LC3-2 show the mine-related SP concentrations for worst-case annual and 24-hour averages predicted by the model. Concentrations are shown to decrease rapidly with distance. Annual and 24-hour mine-related concentrations decrease to 10% of maximum values at 1.5 to 2 miles and 1.5 to 2 miles downwind of the mine, respectively.

When annual average background particulate values of 18 $\mu g/m^3$ (see the Chapter 4 Regional Technical Report for how they were determined) are added to projected mine-related contributions, concentrations greater than the annual primary NAAQS of 75 $\mu g/m^3$ are not predicted to occur, whereas the concentrations are predicted to be greater than the annual Wyoming standard of 60 $\mu g/m^3$ within 0.5 miles of the mine for the years 1985, 1990, and EOML. Background concentrations are projected to contribute 70% to TSP levels at 0.5 to 1 mile and 3 to 4 miles downwind from the mine for annual and 24-hour averaging periods, respectively.

If projected mine-related 24-hour SP values and background concentrations of 35 $\mu g/m^3$ are combined, concentrations are predicted to be greater than the 24-hour primary NAAQS of 260 $\mu g/m^3$ within 0.5, 1, 1, and 1 miles, and greater than the Wyoming standard of 150 $\mu g/m^3$ within 1, 1.5, 1.5, and 1.5 miles of the mine for the years 1980, 1985, 1990, and EOML, respectively.

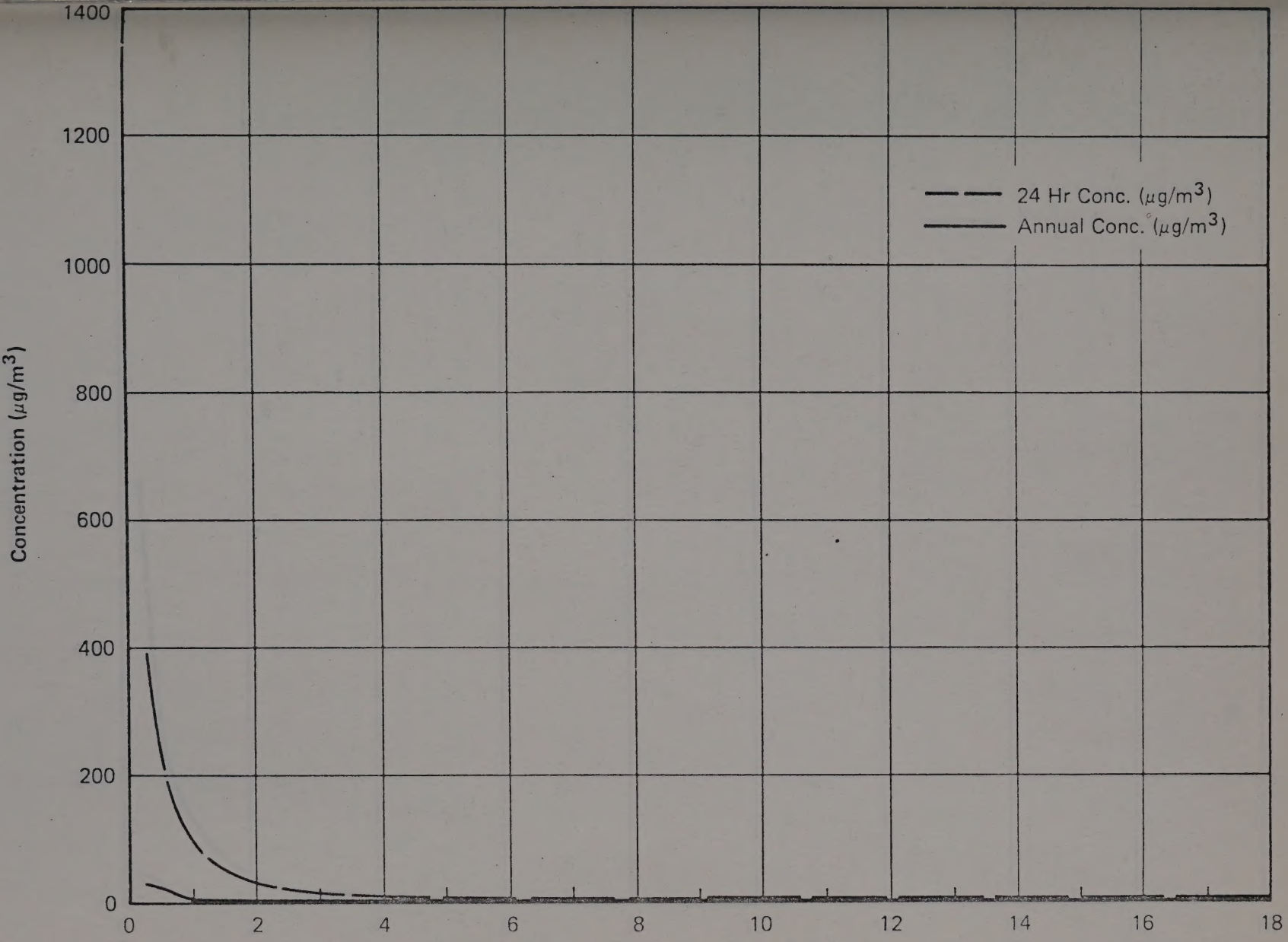

Figure LC3-1

1980 Long Canyon SP Concentrations

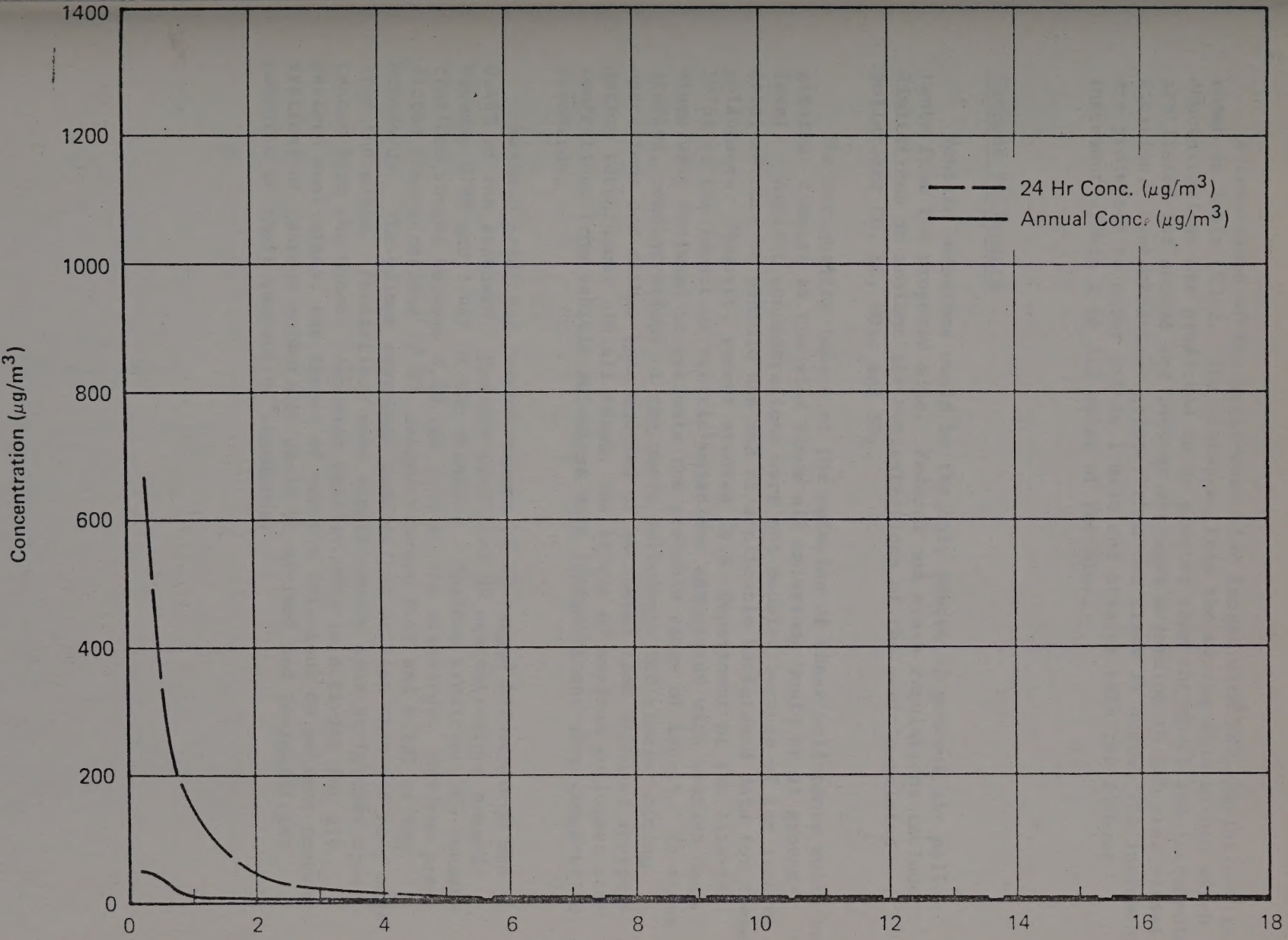

Figure LC3-2

1985, 1990, and EOML Long Canyon SP Concentrations

A comparison of the worst-case mine impact with PSD regulations is shown in Table LC3-2. The distances from the mining area within which concentrations are predicted to be greater than the specified increments are listed for annual and 24-hour averages according to PSD area classification. Concentrations greater than the Class II annual PSD increment are projected to occur within 1 mile and greater than the 24-hour increment within 2 to 2.5 miles of the mine.

Gaseous Pollutants

Vehicle emissions would be the only source of gaseous air pollutants from the proposed mine. Federal and state regulations include limitations on ambient air concentrations of the vehicle-related pollutants CO, HC, NO_2, and SO_2.

The air quality impact of the emission of these pollutants would be greatest closest to the mine since all emissions would be at ground-level. Ambient concentrations were not modeled because of the lack of detailed data on vehicle use and of applicable background data for these pollutants. However, recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines were reviewed to estimate the probable range of impact. In these studies, concentrations of the above pollutants for similar mining operations had either been modeled or estimated from standard approximation techniques. In all cases, the levels of maximum pollutant concentrations from vehicle emissions were insignificant when compared to standards.

Maximum predicted concentrations of CO ranged between 0.02 and 0.44% of the standard. Maximum predicted HC concentrations ranged between 0.88 and 3.44% of the standard. Maximum predicted NO_2 concentrations ranged between 0.60 and 3.0% of the standards. Maximum predicted concentrations of SO_2 ranged between 0.02 and 0.33% of the standards. The values represent predictions at less than one-half mile from the mines. Predictions were significantly less at further distances from the mines. Assuming similar vehicle activity for all western coal mines, the impact of vehicle emissions on ambient concentrations of gaseous pollutants would be minimal and insignificant compared to their respective standards.

TABLE LC3-2

COMPARISON OF WORST-CASE MODEL PREDICTIONS WITH PSD REGULATIONS

Area Classification	Annual					24-Hour				
	Increment ($\mu g/m^3$)	Distance within which Predicted Concentrations Are Greater than the Increment (miles)				Increment ($\mu g/m^3$)	Distance within which Predicted Concentrations Are Greater than the Increment (miles)			
		1980	1985	1990	EOML		1980	1985	1990	EOML
II	19	1	1	1	1	37	2	2.5	2.5	2.5

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Visibility

The ability of an observer to discern distant objects will be constrained by the capacity of the intervening atmosphere to absorb and scatter visible light within one's field of view. These atmospheric extinction properties and their corresponding effect on visibility degradation depend, in a complicated manner, on the optical nature of ambient molecules, aerosols, and particulates within the line of sight. Additional anthropogenic sources of particulates, such as those attributable to fugitive dust emissions, reduce visibility in the immediate source area. Precise evaluation of the degree of visibility degradation requires a knowledge of several parameters, such as the characteristic particulate number size distribution and the optical properties of particulates within each size range. Such data are generally not available. However, by employing reasonable assumptions, an estimate of the visibility impact may be derived using TSP concentrations.

The hypothetical observer is positioned such that one's line of sight is perpendicular to the average wind direction across the plume within a 22.5° sector. For each year considered, the ERTAQ-simulated downwind SP concentrations ($\mu g/m^3$) (given in Figures LC3-1 through LC3-4) are partitioned by mass into both coal and soil fractions based on the annual emissions summary for each mining process. An appropriate number size distribution is assumed for windblown particulates normalized per unit mass concentration. Sixty percent of the TSP is assumed to populate the optically significant size range. Contributions to the total plume visibility degradation are computed for each fraction using its optical properties and scaling normalized results by the TSP concentrations. Results are presented for each year assuming background visibilities of both 40 miles and 7 miles, the latter characteristic of weather induced visibility degradation. A complete technical description is given in the Chapter 4 Regional Technical Report.

Using this technique, visibilities are computed downwind from the source. Results for worst-case 24-hour SP concentrations for the years 1980, 1985, 1990, and EOML are shown in Table LC3-3. Also given are the mass fractions of the total TSP for coal and soil for each year. For 1980, the visibility of an observer at 1 mile downwind would be approximately 39.8 miles, assuming a background visibility of 40 miles. In general, visibility will increase with downwind distance from the mine. At 5 miles downwind, the visibility will be 40 miles, and at 10 miles it will reach 40 miles. The corresponding values, assuming a background visibility of 7 miles, are 7 miles, 7 miles, and 7 miles, respectively. Additional years are given in the table.

TABLE LC3-3

ACROSS PLUME VISIBILITY DEGRADATION FOR THE PROPOSED LONG CANYON MINE

Year	Mass Fraction		Visibility Downwind					
			Background 40 Miles			Background 7 Miles		
	Coal	Soil	1 Mile	5 Miles	10 Miles	1 Mile	5 Miles	10 Miles
1980	16	84	39.8	40.0	40.0	7.0	7.0	7.0
1985	37	63	39.8	39.9	39.9	7.0	7.0	7.0
1990	37	63	39.8	39.9	39.9	7.0	7.0	7.0
EOML	37	63	39.8	39.9	39.9	7.0	7.0	7.0

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AIR QUALITY MITIGATING MEASURES NOT INCLUDED IN THE PROPOSED ACTION

The measures that will be taken to reduce the impact of the proposed mining activities must be enforceable under state and federal laws and regulations. Appropriate laws include the Clean Air Act of 1970 (U.S. Congress 1970), the Clean Air Act Amendments of 1977, (U.S. Congress 1977), the Wyoming Air Quality Standards and Regulations (Wyoming Statutes 1972), and the Surface Mining Control and Reclamation Act of 1977 (PL 95-87).

Measures Required by Federal Agencies

Office of Surface Mining

Before approval of mining and reclamation plans is granted, the mine plan must demonstrate performance standards that ensure removing the amount maximum of the coal resource; restoring the condition of the mined land; stabilizing surface areas to control erosion and, hence, emissions of fugitive dust; removing topsoil; restoring topsoil; and establishing a permanent vegetative cover for post-mining land-use.

Bureau of Land Management (BLM) and U.S. Geological Survey (USGS)

Enforceable procedures have been provided to ensure that adequate measures are taken during exploration of surface mining of federal coal to avoid, minimize, or correct damages to the environment, including air. Also implemented by the BLM and USGS are procedures to conduct leasing and subsequent management of federal coal, as well as regulations governing operations for discovering, testing, developing, mining, and preparing federal coal.

Environmental Protection Agency (EPA)

Mandated by the Clean Air Act of 1970, Wyoming is responsible for ensuring air quality within its borders and for specifying achievement and maintenance strategies. While the ultimate authority for enforcing the air pollution regulations rests with the EPA, this authority is only exercised when enforcement by the state environmental quality departments fails.

State and Local Agencies

Wyoming Department of Environmental Quality (DEQ)

To ensure that the ambient air quality standards will not be exceeded, the Wyoming DEQ must approve the construction and/or modification and the operation of any facility that will have an impact on air quality (Section 21, Wyoming Statutes 1972). The approval process involves an evaluation of the expected impact on the ambient air quality. The Wyoming DEQ, Division of Air Quality, also generally requires the establishment of a monitoring program to gather data concerning the ambient air quality as a result of the operation of the new or modified facility.

The Air Quality Division is legally required to ensure maintenance of the Air Quality Standards; and, therefore, they are required to ensure that mitigating measures are practiced. This is done as a matter of course through the permit and enforcement procedures. For instance, if the ambient monitoring system reveals that fugitive dust is causing excessive ambient TSP concentrations, the Wyoming DEQ could require any of the following control measures (Section 14, Wyoming Statutes 1972):

"The emission of fugitive dust shall be limited by all persons handling, transporting, or storing any material to prevent unnecessary amounts of particulate matter from becoming airborne to the extent that ambient air standards described in these regulations are exceeded. Control measures described as follows or any equivalent method shall be considered appropriate for such control.

1) use, where possible, of water or chemicals for control of dust in the demolition of existing buildings, or structures, construction operations, the grading of roads or the clearing of land;

2) application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which can give rise to airborne dusts;

3) installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials; adequate containment methods shall be employed during sandblasting or other similar operations;

4) covering, at all times when in motion, open-bodied trucks, transporting materials likely to give rise to airborne dust;

5) conduct of agricultural practices such as tilling of land, application of fertilizers, etcetera, in such a manner as to prevent dust from becoming airborne;

6) the paving of roadways and their maintenance in a clear condition;

7) the prompt removal of earth or other material from paved streets onto which earth or other material has been transported by trucking or earth moving equipment, erosion by water, or other means."

These control measures are further enforced by the Clean Air Act Amendments of 1977. The Prevention of Significant Deterioration regulations (PSD) as mandated by the Amendments require specific control measures be implemented at a new facility or on modification of an existing source. If this facility is located in an area of air quality standard nonattainment (NA) status or is predicted to significantly impact an NA area, even more stringent regulations and control procedures apply. For example, if the new source will operate in an area of recorded TSP violations, through the permitting process, implementation of a monitoring program, Best Available Control Technology, Lowest Achievable Emission Rates, and/or the Offset Policy may apply. The Offset Policy mandates that emissions from existing sources in the region must be reduced in an amount more than sufficient to offset emissions from the new sources.

Applicant Committed Measures

There are no air quality or climate mitigative measures committed subsequent to the filed mine plan. Since federal and state regulations (mining and reclamation, emissions, and air quality maintenance) require that best available control measures be included in the mine plans, they have been considered in the impact analysis (Chapter 3).

Monitoring and Research Programs

To develop a base for future mine impact analyses and ascertain attainment or nonattainment of Air Quality Standards, the operators would be required to provide a monitoring program. This would be for the purpose of determining both background concentration levels and total ambient levels (background plus mining impact). Therefore, the monitoring program would measure TSP levels both in the predominant upwind and downwind directions. As reclamation is accomplished, the compliance officers (state and federal) would conduct periodic inspections of mining areas to ensure reclamation is accomplished in accordance with an approved reclamation plan.

UNAVOIDABLE ADVERSE IMPACTS FOR LONG CANYON

For the Long Canyon mine, no optional mitigative measures are proposed. All measures proposed in the mining plans are already included in the analysis. Therefore, all reductions in concentrations associated with mitigation have already been considered in the impacts reported in Chapter 3. Unavoidable adverse impacts are then equivalent to impacts discussed in Chapter 3.

Impacts on Air Quality

When annual average background particulate values of 18 $\mu g/m^3$ (see Chapter 4 of the Regional Technical Report* for how they were determined) are added to projected mine-related contributions, the annual primary NAAQS of 75 $\mu g/m^3$ is not predicted to be exceeded, whereas the annual Wyoming standard of 60 $\mu g/m^3$ is predicted to be exceeded within 0.5 miles of the active site for the years 1980, 1985, 1990, and EOML, respectively (see Table LC5-1).

If projected mine-related 24-hour SP values and background concentrations of 35 $\mu g/m^3$ are combined, the 24-hour primary NAAQS of 260 $\mu g/m^3$ is predicted to be exceeded within 0.5, 1, 1, and 1 miles of the active site; and the Wyoming standard of 150 $\mu g/m^3$ is predicted to be exceeded within 1, 1.5, 1.5, and 1.5 miles of the active site for the years 1980, 1985, 1990, and EOML, respectively. (These projections are based on worst-case meteorological conditions.)

A comparison of the worst-case mine impact with PSD regulations is shown in Table LC5-2. The distances from the mining area within which the specified regulations are predicted to be exceeded are listed for annual and 24-hour averages according to PSD area classification.

Mine-related NO_x and SO_2 emissions are expected to be insignificant, as discussed in Chapter 4 of the Regional Statement Component; therefore, ambient pollutant concentrations have not been predicted.

Gaseous Pollutants

Recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines were reviewed to estimate the probable range of impact. Maximum predicted concentrations of CO ranged between 0.02 and 0.44% of the standard. Maximum predicted HC concentrations ranged between 0.88 and 3.44% of the standards.

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*Available at the Rock Springs District BLM office.

SW Ch._____
Sec._____
ERT _____
Cd. ____ Pg. ____

TABLE LC5-1

DISTANCES FROM ACTIVE MINE SITE WITHIN WHICH AMBIENT AIR QUALITY STANDARDS FOR TSP ARE PREDICTED TO BE EXCEEDED

Averaging Time	Standard ($\mu g/m^3$)	Year			
		1980	1985	1990	EOML
24-hour	150*	1 mile	1.5 miles	1.5 miles	1.5 miles
	260**	0.5 mile	1 mile	1 mile	1 mile
Annual	60*	0 miles	0.5 miles	0.5 miles	0.5 miles
	75**	0 miles	0 miles	0 miles	0 miles

*Wyoming
**NAAQS

SW Ch. _____
Sec. _____
ERT 3-13-28
Cd. 6829 Pg. ____

TABLE LC5-2

DISTANCES FROM ACTIVE MINE SITE WITHIN WHICH
PSD REGULATIONS FOR TSP
ARE PREDICTED TO BE EXCEEDED

Averaging Time	Standard* ($\mu g/m^3$)	Year			
		1980	1985	1990	EOML
24-hour	37	2 miles	2.5 miles	2.5 miles	2.5 miles
Annual	19	1 mile	1 mile	1 mile	1 mile

*Area II classification

Maximum predicted NO_2 concentrations ranged between 0.60 and 3.0% of the standards. Maximum predicted concentrations of SO_2 ranged between 0.02 and 0.33% of the standards. The values represent predictions at less than one-half mile from the mines. Predictions were significantly less at further distances from the mines.

Visibility

Particulates, such as those attributable to fugitive dust emissions, reduce visibility in the immediate source area. An estimate of visibility impact may be derived using TSP concentrations. Visibilities are computed downwind of the source.

For 1980, the visibility of an observer at 1 mile downwind would be approximately 39.9 miles, assuming a background visibility of 40 miles. In general, visibility will increase with downwind distance from the mine. At 5 miles downwind the visibility will be 40 miles, and at 10 miles it will also be 40 miles. The corresponding values, assuming a background visibility of 7 miles, are 7 miles, 7 miles, and 7 miles, respectively.

RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY FOR LONG CANYON

Short-term use of the environment (mining operations) will produce impacts that include generation of fugitive dust and gaseous pollutants (from vehicles) and a reduction in visibility.

The air pollution caused by the mine will be primarily a short-term phenomenon; i.e., most air quality impacts will cease when active mining and reclamation are completed. Short-term air quality impacts include fugitive dust generated by the mining activities and reductions in visibility.

Air pollution from vehicle exhausts and fugitive dust emissions from access roads after the completion of mining will depend on the subsequent use of the land. Access to the property will have been established. Continued use of unpaved access roads could result in continuing emissions of fugitive dusts from wind erosion and gaseous pollutants from vehicle exhausts. If these impacts continue after EOML, they will be long-term impacts. Since subsequent land use is not known, the extent of these impacts cannot be quantified but is expected to be minimal. Minimal concentrations are anticipated because concentrations predicted during mine life based on traffic associated with mining operations is insignificant when compared to national standards. Traffic volume would have to increase significantly over that estimated at peak mining operations to substantially affect ambient concentrations in the future. Therefore, the short-term use of the natural resources (coal) is not expected to significantly affect long-term maintenance of air quality.

The proposed short-term use of the environment does not foreclose other additional long-term uses of the environment. That is, air quality will not be degraded after EOML, foreclosing the development of other industrial sources in the area (due to PSD allowable increments) or altering the air quality from its presently rural character.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES FOR LONG CANYON

Most air quality impacts associated with the Long Canyon mine will be reversed when the land is reclaimed. The only long-term air quality impacts anticipated are those resulting from continued use of unpaved access roads after the project has been completed or halted. Since use of these roads could be stopped by blocking access or reclaiming roadbeds, no irreversible air quality impacts are predicted.

Irretrievable air quality impacts will occur. The loss of good air quality for the period of the project cannot be retrieved. During the life of the project, TSP standards may be exceeded and visibility reduced in the immediate vicinity of the project.

NORTH BLOCK EXISTING CLIMATE

The proposed North Block mining area is located in Lincoln County, approximately 10 miles northwest of Kemmerer and adjacent to the northeast flank of the Bear River Divide. The general account of the temperature and precipitation patterns given in the regional analysis describes the climate in the vicinity of North Block area.

Site-Specific Parameters

Sunshine

Since the North Block mining area is situated in a high plains/foothills area, the annual percentage of possible sunshine is expected to approximate the 65% statewide average.

Winds

Utah Power & Light (UPL) owns a field network of four meteorological observation sites in the vicinity of its Naughton Power Plant, which is located near Kemmerer in Lincoln County and closer to the North Block mining area than the Fort Bridger National Weather Service (NWS) site used in the regional analysis. From a review of a one-year (1 August 74 to 1 September 75) compilation of surface wind statistics (Golden and Petersen 1976) at these sites, the predominant wind direction and speed characteristics observed are comparable to the climatological values at Fort Bridger (see Chapter 2 Regional Technical Report*). However, there are some discernible differences in the surface winds between the Fort Bridger and UPL sites, and they are outlined below.

Annually, the winds at each of the UPL sites show a greater tendency for directional variation. The three predominant wind direction sectors at three of the UPL sites are west through northwest and comprise 40% of the annual number of hourly observations. The fourth site indicates a predominant flow in the southwest through west sectors, which accounts for about 55% of all annual observations. Thus, the frequencies of occurrence of the predominant wind direction sectors for each of the sites are somewhat lower than the 64% at Fort Bridger. In addition,

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*Available at Rock Springs District BLM Office.

secondary directional maxima associated with north through east sector winds are shown to occur at each of the UPL sites. There are no secondary maxima evident in the Fort Bridger data.

The annual average wind speeds at the UPL sites range from 8 to 13 mph, less than the 15 mph average at Fort Bridger.

Atmospheric Temperature and Stability

Similar to the entire ES region, the North Block mining area is subject to large seasonal and diurnal temperature variations. Temperatures are expected to closely parallel those observed at Kemmerer, which indicate mean monthly minima/maxima of 5°F/29°F and 44°F/82°F during January and July, respectively. Temperature extremes should range from -32 to 97°F. The growing season is about 185 days per year.

Vertical temperature profiles were also obtained by UPL during seasonal field studies (Golden and Petersen 1976). Like the surface wind data, the vertical temperature profile obtained by UPL is similar to the climatological values determined for three NWS radiosonde sites and discussed in the Regional Chapter 2 analysis. However, some differences are notable.

Of all morning soundings (79 total), 85% contained some type of inversion (either surface-based or upper-level). The three NWS sites indicated about a 90% frequency. Of the UPL morning soundings, 65% had surface-based inversions with an average depth of 300 feet. Thus, the average depth and frequency of surface-based inversions in the vicinity of the proposed North Block mining area is again lower than the approximate 800-foot average depth, which occurred with an 85% average frequency at the three NWS sites. This is probably because of faster wind speeds and/or lack of sheltering by large topographic barriers at the UPL locations than at the NWS sites at Lander, Wyoming (in the lee of the Wind River Range), Grand Junction, Colorado (in the Gunnison River Valley), and Salt Lake City, upwind of the Wasatch Mountains and affected by the stability influence of the Great Basin High.

Only 11% of the afternoon soundings (after 12:00 A.M. LST) showed inversions of any type. Again, this value is less than the 25 to 35% range indicated at the three NWS sites.

Precipitation

Annual average precipitation and total snowfall should approximate the climatological values of 9 inches and 55 inches, respectively, observed at Kemmerer.

Evapotranspiration

An annual soil moisture deficit of about 10 inches noted for Kemmerer in the regional analysis should be characteristic of the North Block mining area. The growing season roughly coincides with the period of high soil moisture deficit.

Severe Weather Events

The number of thunderstorm and hail days should be about 30 and 3 per year, respectively. The likelihood of tornadoes occurring in this region is very low.

Future Climate

It is not anticipated that the local climatology will change over the next fifteen years.

NORTH BLOCK EXISTING AIR QUALITY

The proposed North Block site is not in the prevailing downwind direction of pollutant dispersion from Kemmerer. Therefore, the present air quality at this location should have a rural character. Consequently, the existing TSP levels at this site should range from 10 to 20 $\mu g/m^3$ annually and 30 to 45 $\mu g/m^3$ for 24 hours. The magnitude of these levels is less than one-third of the appropriate state standards. Based on five years of visual observations recorded at Fort Bridger, a representative background visual range in the vicinity of the North Block site should be approximately 40 miles.

Concentrations of SO_2 around North Block should also reflect its rural setting; i.e., levels less than 5 $\mu g/m^3$ annually and less than 25 $\mu g/m^3$ for a daily averaging period. The magnitude of these concentrations is only about 10% of the annual and 24-hour state standards. In addition, annual NO_2 concentrations should be less than 10 $\mu g/m^3$ or again only 10% of the standard.

Future Environment at North Block Without the Proposed Action

If the proposed mining does not occur, it is anticipated that future regional TSP, SO_2, and NO_2 levels through the year 1990 will be similar to existing concentrations.

The expansion of the Naughton Power Plant, however, may have a localized effect on air quality near the proposed North Block mine site; but this will be minimal. Although the expanded facility is expected to increase TSP emissions by 262 pounds per hour (17%), SO_2 emissions by 1,094 pounds per hour (5%), and NO_x emissions by 7,280 pounds per hour (50%), ambient air concentrations should not change appreciably at the proposed mine site. Figures SC2-3 and SC2-4 indicate the magnitude and spatial distribution of future TSP levels in the vicinity of the North Block mine site.

Future visibility at this location should remain similar to existing visibility.

NORTH BLOCK AIR QUALITY IMPACTS

Emissions from the Proposed Mine

Particulate emissions from individual mining activities were calculated using emission factors developed in recent studies of fugitive dust sources from mining (EPA 1977; PEDCo 1976). These factors require estimates of coal production rates, overburden removal, haulage distances, employee access distances, vehicular speeds, and disturbed acreage. In addition, some of the factors require correction for soil silt content and climatic conditions. Estimates of operational parameters were obtained from the mining plan and from personal communications with mining engineers. Soil silt content was determined through consultation with the U.S. Department of Agriculture and the BLM. Climatic factors were estimated from local and regional climatological surveys. All formulas and data used in the emission calculations as well as inherent uncertainties are given in Chapter 4 of the Regional Technical Report.* Emission estimates for the different source activities with the mine at full operation are given in Table NB3-1 for 1980, 1985, 1990, and end of mine life (EOML).

The emissions burden projections presented in Table NB3-1 represent a conservative (upper bound) assessment of the impact of the proposed mine. This conservatism assumes that minimal dust controls would be applied to each mine activity. Therefore, to indicate the range of TSP impact that might be expected from variations in operating practices, emission burdens were also estimated for a more probable situation, where more stringent measures would be implemented for wind erosion control at the surface mines. These control measures are to be regarded as measures that may eventually be implemented by the mines (not mitigative measures).

For the contribution of wind erosion from unreclaimed and partially reclaimed land, the most probable situation would be represented by mulching and furrowing in the Spring, followed by Fall planting. Note that the projected emissions (Table NB3-1) were based on the assumption that mulching and planting would be performed in the Fall in a one-step operation. Surface roughness impediments to erosion (furrowing), moreover, were neglected in that analysis.

Results of the most probable analysis are presented in Table NB3-2. The slight variations among the factors that account for the emissions reduction achieved by Spring furrowing and mulching (versus Fall

*Available at the Rock Springs District BLM Office.

TABLE NB3-1

NORTH BLOCK PARTICULATE EMISSIONS

	TSP (Tons per Year)			
	1980	1985	1990	EOML
Overburden Removal	0	133	133	133
Ore Loading	0	70	70	70
Truck Dumping	0	14	14	14
Train Loading	0	0	0	0
Conveying	0	7	7	7
Coal Storage	0	0	0	0
Crushing (Primary)	0	0.7	0.7	0.7
Crushing (Secondary)	0	5.6	5.6	5.6
Overburden Dump Disturbance	0	50	0	375
Employee Access Roads	33	132	132	132
Haul Roads (Coal)	0	158	158	158
Haul Roads (Overburden)	0	40	0	60
Haul Road Repair	0	56	56	56
Dozers (Overburden Dumps)	56	56	56	56
Wind Erosion	245	299	298	298
Totals	334	1,021	930	1,365

TABLE NB3-2

MOST PROBABLE PARTICULATE EMISSIONS ESTIMATES FOR NORTH BLOCK

Year	Total Projected Emissions from Table NB3-1 (tons per year)	Reduction of Wind Erosion Emissions from Spring Mulching and Furrowing		Miscellaneous Reductions in Emissions (tons per year)	Most Probable Emissions (tons per year)	Overall Percent Reduction from Projected Emissions
		Reduction Factor*	Emissions Reduction (tons per year)			
1980**	334	0.76	186	23†	125	63
1985	1,021	0.76	227	92†	702	31
1990	930	0.76	227	92†	611	34
EOML	1,365	0.76	227	527††	611	55

*Percent reduction = 100 x (reduction factor); furrowing factor K = 0.6, 2,000 pounds per acre of mulch assumed to be applied on April 15 of the analysis year.

**Mine is under construction in this year.

†Oiled gravel access roads (versus watered gravel roads).

††Assuming, in addition to oiled gravel access roads, that retrieval of overburden from spoils dumps takes place after EOML, or not at all.

mulching and no furrowing) result from differences in predominant soil types, climatic factors, and reclamation schedules among the four surface mines.

From the final column of the table, it is apparent that, during the analysis years representing the more typical levels of coal production and mine operation (1985 and 1990), the "most probable" estimates are 31 to 34% less than the more conservative "projected emissions" for the North Block mine. The lack of reliability of the most recently published fugitive dust emission factors for coal mines (EPA 1977) and the variability of such factors may be at least as great as the actual range of emissions implied by the figures in Table NB3-2.

Impact on Air Quality

To assess the impact of the mine on the atmospheric environment, estimates must be made of the ambient suspended particulates (SP) concentrations resulting from the mine emissions. To accomplish this, an atmospheric diffusion model has been applied to the mine site. The effect of local emissions is considered in the model both over a long period of time (annual average) and for short-duration exposures (daily averages). All of the emissions from the mine have been added to represent a single source originating across the entire mining area. This area source is considered to be the annual disturbed acreage for modeling of annual averages and 25 acres for modeling of daily averages. This is a reasonable representation considering the wide variations in individual emission points during mining operations. However, for some mines more than 25 acres may be operationally active during any particular 24-hour period. Increasing the size of the area source as much as tenfold would serve to decrease predicted SP concentrations within approximately 1 mile of the mine site but would have little effect further downwind.

Meteorological input to annual average computations consisted of a stability wind rose derived from five years of observations at Rock Springs. Concentrations were calculated for 480 possible weather conditions and weighted by their frequency over a year. The worst-case wind direction was identified as west due to its high frequency of lower wind speeds that result in high ground-level concentrations.

To model worst-case 24-hour concentrations, it was assumed that a wind speed of 4 miles per hour (mph) and a stable atmosphere persisted for 12 hours, followed by a wind speed of 4 mph and a neutral atmosphere

persisting for 4 hours, under a northwest wind for the 16-hour period. No mine impact was assumed for the other 8 hours. Such conditions were derived from five years (1950 to 1954) of Fort Bridger persistence data and represent worst-case meteorology for 24-hour modeling analyses.

Prior to evaluation of the simulated mine results, the reader is reminded of the serious limitations inherent in the state-of-the-art emission factors as well as the uncertainties associated with the modeling of fugitive dust emissions. A complete description of the modeling analysis and inherent uncertainties is presented in Chapter 4 of the Regional Technical Report.

Figures NB3-1 through NB3-4 show the mine-related SP concentrations for worst-case annual and 24-hour averages predicted by the model. Concentrations are shown to decrease rapidly with distance. Annual and 24-hour mine-related concentrations decrease to 10% of maximum values at 1 to 1.5 miles and 1.5 to 2 miles downwind of the mine, respectively.

The worst-case SP concentrations shown in Figures NB3-1 through NB3-4 may be scaled to most probable SP values by multiplying each worst-case concentration by the ratio of most probable emissions to worst-case emissions. For example, using the overall precent reduction from projected worst-case emissions (hence concentrations) of 55% for EOML in Table NB3-2, the worst-case annual concentration of 11 $\mu g/m^3$ and 24-hour concentration of 140 $\mu g/m^3$ at a receptor located 2 miles from the mine would decrease to 5 $\mu g/m^3$ and 63 $\mu g/m^3$, respectively. The decrease in mine-related concentrations implies that projected concentrations greater than the standards for the most probable emissions would not occur as far downwind of the mine as worst-case emissions.

When annual average background particulate values of 16 $\mu g/m^3$ for 1980 and 15 $\mu g/m^3$ for all other years (see Chapter 4 Regional Technical Report for how they were determined) are added to projected mine-related contributions, total levels are predicted to be greater than the annual primary NAAQS of 75 $\mu g/m^3$ within 0, 0.5, 0.5, and 0.5 miles and greater than the annual Wyoming standard of 60 $\mu g/m^3$ within 0.5, 1, 1, and 1 miles of the mine for the years 1980, 1985, 1990, and EOML, respectively. Background concentrations are projected to contribute 70% of total TSP levels at 1 to 2.5 miles and 2.5 to 7 miles downwind from the mine for annual and 24-hour averaging periods, respectively.

If projected mine-related 24-hour SP values and background concentrations of 49 $\mu g/m^3$ for 1980 and 46 $\mu g/m^3$ for all other years are combined, concentrations are predicted to be greater than the 24-hour primary NAAQS of 260 $\mu g/m^3$ within 1, 1.5, 1, and 1.5 miles, and greater than the Wyoming standard of 150 $\mu g/m^3$ within 1, 2, 2, and 2.5 miles of the mine for the years 1980, 1985, 1990, and EOML, respectively.

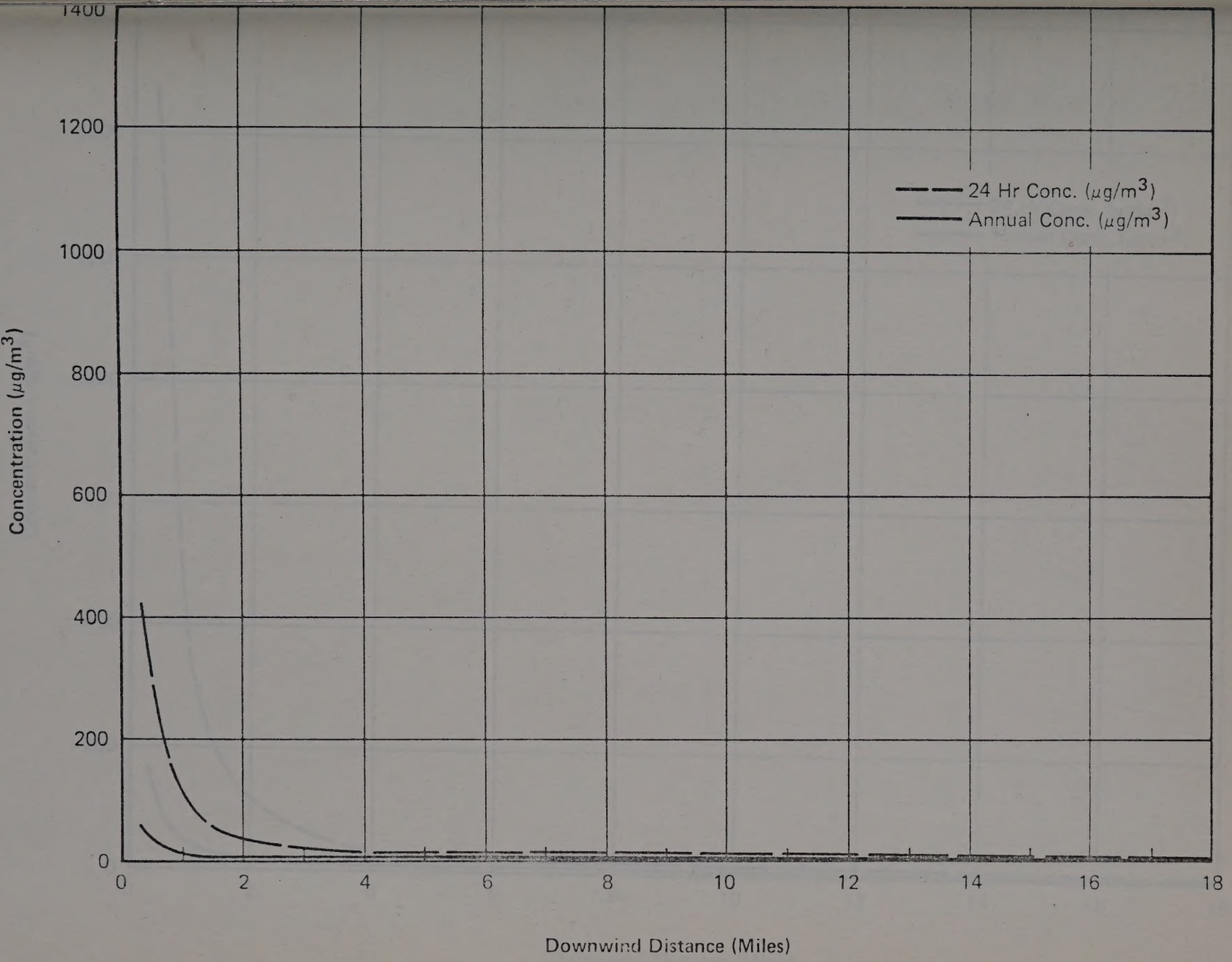


Figure NB3-1

1980 North Block SP Concentrations

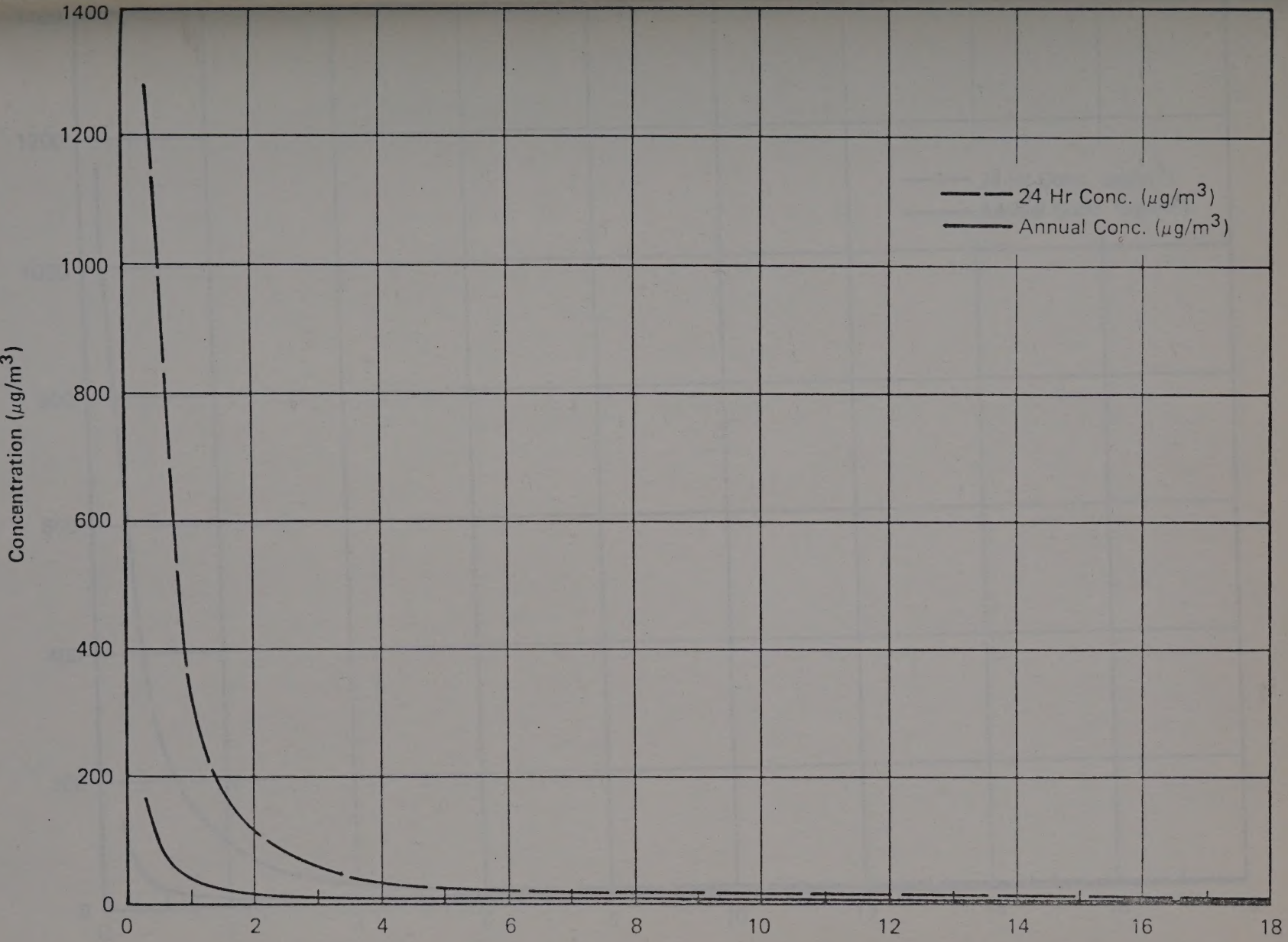


Figure NB3-2

1985 North Block SP Concentrations

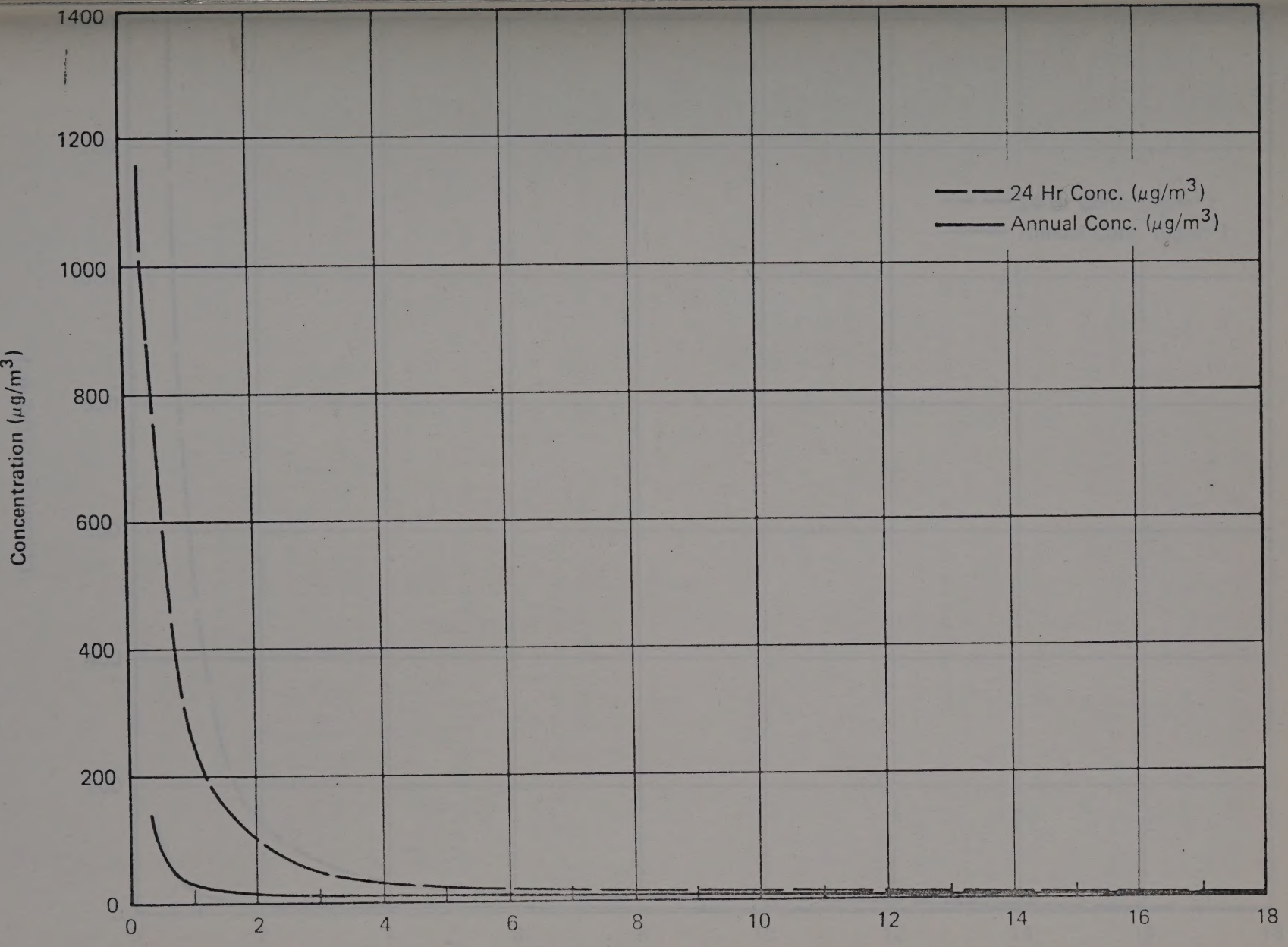
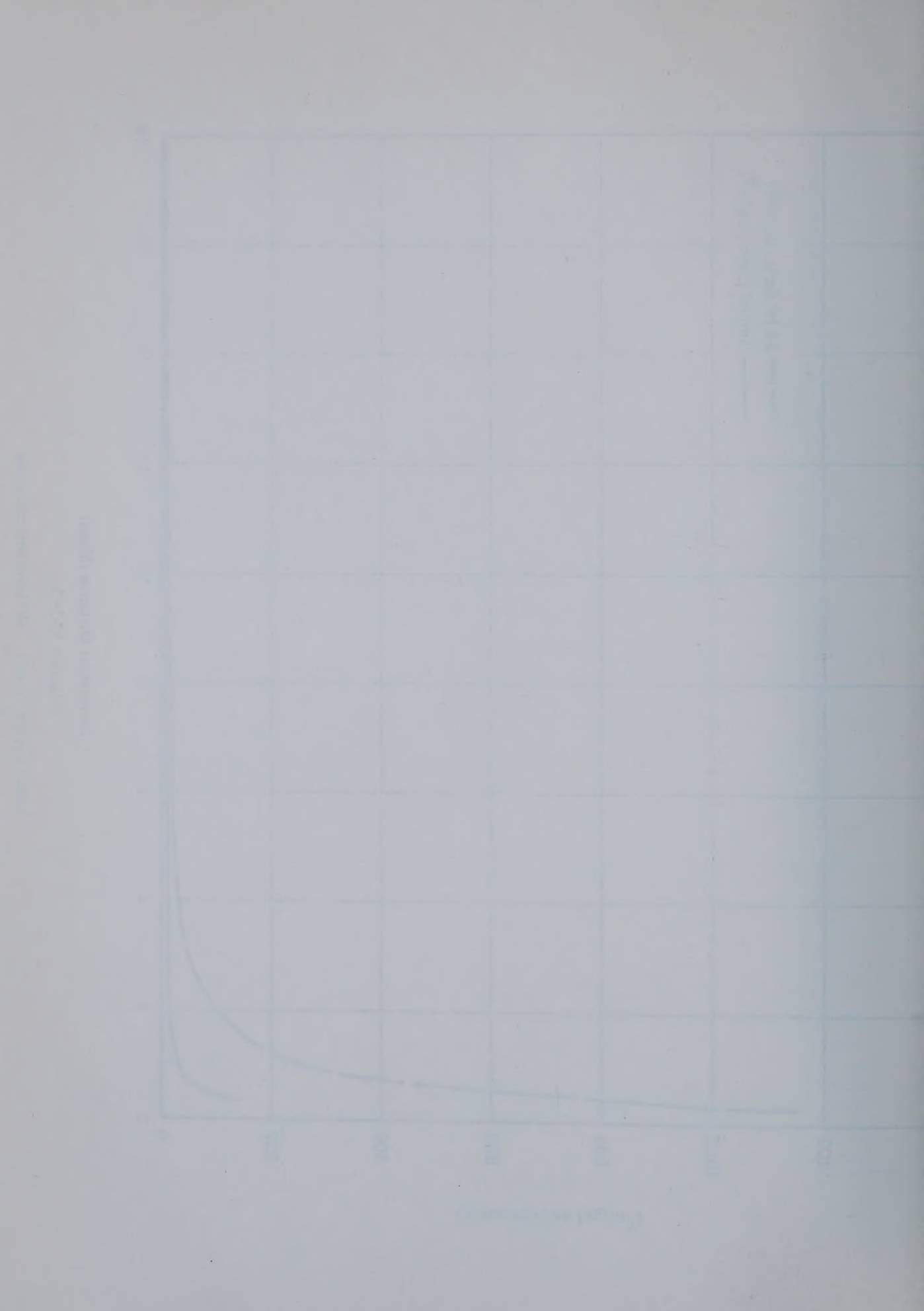


Figure NB3-3

1990 North Block SP Concentrations



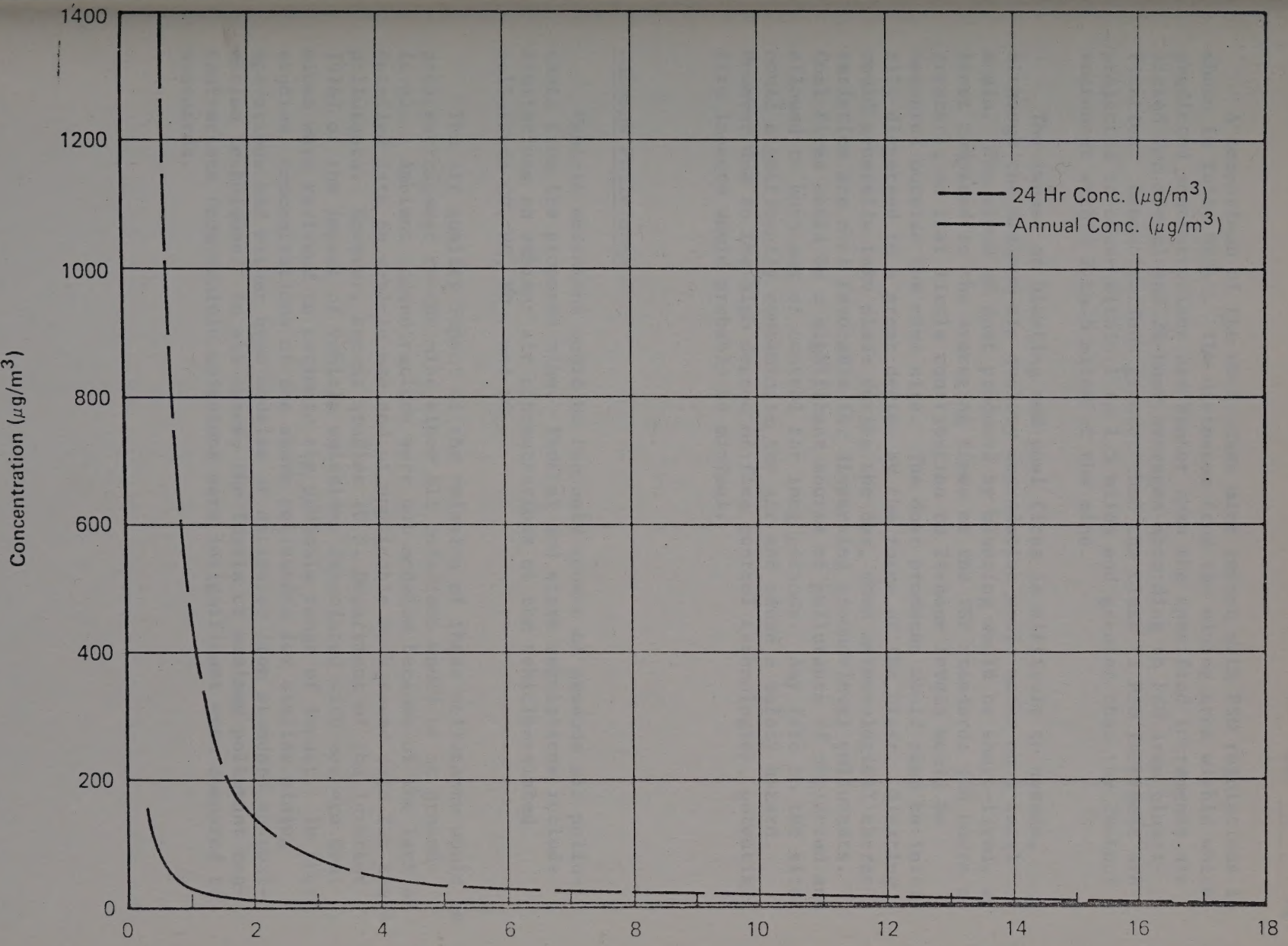


Figure NB3-4

EOML North Block SP Concentrations

A comparison of the worst-case mine impact with PSD regulations is shown in Table NB3-3. The distances from the mining area within which predicted concentrations are higher than the specified increments are listed for annual and 24-hour averages according to PSD area classification. Concentrations greater than the Class II PSD increment are projected to occur within 1 to 1.5 miles and greater than the 24-hour increment within 2 to 5 miles of the mine.

The impact of blasting and coal fires is difficult to assess, although the maximum air quality degradation would occur on a local scale. The cloud of dust produced by blasting would be short-lived, at least compared to the averaging times of the TSP standards (24 hours or greater), so that little contribution to 24-hour levels would be measured outside the mine site. The dust produced would also be initially dispersed to a great degree by the force of the blast. Blasting would generally take place during the day, when meteorological characteristics are most favorable for dispersing ground-level pollutants. Coal fires could be a significant source of pollutants if neglected and allowed to burn out of control for long periods. Any fire on the site could significantly contaminate the air and cause a safety hazard. However due to the high degree of fire control technologies, potential fire impacts would probably be minimal.

Gaseous Pollutants

Vehicle emissions would be the only source of gaseous air pollutants from the proposed mine. Federal and state regulations include limitations on ambient air concentrations of the vehicle-related pollutants CO, HC, NO_2, and SO_2.

The air quality impact of the emission of these pollutants would be greatest closest to the mine since all emissions would be at ground-level. Ambient concentrations were not modeled because of the lack of detailed data on vehicle use and of applicable background data for these pollutants. However, recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines were reviewed to estimate the probable range of impact. In these studies, concentrations of the above pollutants for similar mining operations had either been modeled or estimated from standard approximation techniques. In all cases, the levels of maximum pollutant concentrations from vehicle emissions were insignificant when compared to standards.

TABLE NB3-3

COMPARISON OF WORST-CASE MODEL PREDICTIONS WITH PSD REGULATIONS

Area Classification	Increment ($\mu g/m^3$)	Annual				Increment ($\mu g/m^3$)	24-Hour			
		Distance within which Predicted Concentrations Are Greater than the Increment (miles)					Distance within which Predicted Concentrations Are Greater than the Increment (miles)			
		1980	1985	1990	EOML		1980	1985	1990	EOML
II	19	1	1.5	1.5	1.5	37	2	4	4	5

Maximum predicted concentrations of CO ranged between 0.02 and 0.44% of the standard. Maximum predicted HC concentrations ranged between 0.88 and 3.44% of the standard. Maximum predicted NO_2 concentrations ranged between 0.60 and 3.0% of the standards. Maximum predicted concentrations of SO_2 ranged between 0.02 and 0.33% of the standards. The values represent predictions at less than one-half mile from the mines. Predictions were significantly less at further distances from the mines. Assuming similar vehicle activity for all western coal mines, the impact of vehicle emissions on ambient concentrations of gaseous pollutants would be minimal and insignificant compared to their respective standards.

Visibility

The ability of an observer to discern distant objects will be constrained by the capacity of the intervening atmosphere to absorb and scatter visible light within one's field of view. These atmospheric extinction properties and their corresponding effect on visibility degradation depend, in a complicated manner, on the optical nature of ambient molecules, aerosols, and particulates within the line of sight. Additional anthropogenic sources of particulates, such as those attributable to fugitive dust emissions, will reduce visibility in the immediate source area. Precise evaluation of the degree of visibility degradation requires a knowledge of several parameters, such as the characteristic particulate number size distribution and the optical properties of particulates within each size range. Such data are generally not available. However, by employing reasonable assumptions an estimate of the visibility impact may be derived using TSP concentrations.

The hypothetical observer is positioned such that one's line of sight is perpendicular to the average wind direction across the plume within a 22.5° sector. For each year considered, the ERTAQ-simulated downwind SP concentrations ($\mu g/m^3$) (given in Figures NB3-1 through NB3-4) are partitioned by mass into both coal and soil fractions based on the annual emissions summary for each mining process. An appropriate number size distribution is assumed for windblown particulates normalized per unit mass concentration. Sixty percent of the TSP is assumed to populate the optically significant size range. Contributions to the total plume visibility degradation are computed for each fraction using its optical properties and scaling normalized results by the TSP concentrations. Results are presented for each year assuming background visibilities of both 40 miles and 7 miles, the latter characteristic of weather induced visibility degradation. A complete technical description is given in Chapter 4 of the Regional Technical Report.

Using this technique visibilities are computed downwind from the source. Results for worst-case 24-hour SP concentrations for the years 1980, 1985, 1990, and EOML are shown in Table NB3-4. Also given are the mass fractions of the total TSP for coal and soil for each year. For 1980, the visibility of an observer at 1 mile downwind would be approximately 39.9 miles, assuming a background visibility of 40 miles. In general, visibility will increase with downwind distance from the mine. At 5 miles downwind, the visibility will be 39.9 miles, and at 10 miles it will reach 40 miles. The corresponding values, assuming a background visibility of 7 miles, are 7 miles, 7 miles, and 7 miles, respectively. Additional years are given in the table.

TABLE NB3-4

ACROSS PLUME VISIBILITY DEGRADATION FOR THE PROPOSED NORTH BLOCK MINE

Year	Mass Fraction		Visibility Downwind					
			Background 40 Miles			Background 7 Miles		
	Coal	Soil	1 Mile	5 Miles	10 Miles	1 Mile	5 Miles	10 Miles
1980	0	100	39.9	39.9	40.0	7.0	7.0	7.0
1985	10	90	39.6	39.8	39.9	6.9	7.0	7.0
1990	12	90	39.6	39.8	39.9	6.9	7.0	7.0
EOML	7	93	39.5	39.8	39.8	6.9	7.0	7.0

AIR QUALITY MITIGATING MEASURES NOT INCLUDED IN THE PROPOSED ACTION

The measures that will be taken to reduce the impact of the proposed mining activities must be enforceable under state and federal laws and regulations. Appropriate laws include the Clean Air Act of 1970 (U.S. Congress 1970), the Clean Air Act Amendments of 1977, (U.S. Congress 1977), the Wyoming Air Quality Standards and Regulations (Wyoming Statutes 1972), and the Surface Mining Control and Reclamation Act of 1977 (PL 95-87).

Measures Required by Federal Agencies

Office of Surface Mining

Before approval of mining and reclamation plans is granted, the mine plan must demonstrate performance standards that ensure removing the amount maximum of the coal resource; restoring the condition of the mined land; stabilizing surface areas to control erosion and, hence, emissions of fugitive dust; removing topsoil; restoring topsoil; and establishing a permanent vegetative cover for post-mining land-use.

Bureau of Land Management (BLM) and U.S. Geological Survey (USGS)

Enforceable procedures have been provided to ensure that adequate measures are taken during exploration of surface mining of federal coal to avoid, minimize, or correct damages to the environment, including air. Also implemented by the BLM and USGS are procedures to conduct leasing and subsequent management of federal coal, as well as regulations governing operations for discovering, testing, developing, mining, and preparing federal coal.

Environmental Protection Agency (EPA)

Mandated by the Clean Air Act of 1970, Wyoming is responsible for ensuring air quality within its borders and for specifying achievement and maintenance strategies. While the ultimate authority for enforcing the air pollution regulations rests with the EPA, this authority is only exercised when enforcement by the state environmental quality departments fails.

State and Local Agencies

Wyoming Department of Environmental Quality (DEQ)

To ensure that the ambient air quality standards will not be exceeded, the Wyoming DEQ must approve the construction and/or modification and the operation of any facility that will have an impact on air quality (Section 21, Wyoming Statutes 1972). The approval process involves an evaluation of the expected impact on the ambient air quality. The Wyoming DEQ, Division of Air Quality, also generally requires the establishment of a monitoring program to gather data concerning the ambient air quality as a result of the operation of the new or modified facility.

The Air Quality Division is legally required to ensure maintenance of the Air Quality Standards; and, therefore, they are required to ensure that mitigating measures are practiced. This is done as a matter of course through the permit and enforcement procedures. For instance, if the ambient monitoring system reveals that fugitive dust is causing excessive ambient TSP concentrations, the Wyoming DEQ could require any of the following control measures (Section 14, Wyoming Statutes 1972):

"The emission of fugitive dust shall be limited by all persons handling, transporting, or storing any material to prevent unnecessary amounts of particulate matter from becoming airborne to the extent that ambient air standards described in these regulations are exceeded. Control measures described as follows or any equivalent method shall be considered appropriate for such control.

1) use, where possible, of water or chemicals for control of dust in the demolition of existing buildings, or structures, construction operations, the grading of roads or the clearing of land;

2) application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which can give rise to airborne dusts;

3) installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials; adequate containment methods shall be employed during sandblasting or other similar operations;

4) covering, at all times when in motion, open-bodied trucks, transporting materials likely to give rise to airborne dust;

5) conduct of agricultural practices such as tilling of land, application of fertilizers, etcetera, in such a manner as to prevent dust from becoming airborne;

6) the paving of roadways and their maintenance in a clear condition;

7) the prompt removal of earth or other material from paved streets onto which earth or other material has been transported by trucking or earth moving equipment, erosion by water, or other means."

These control measures are further enforced by the Clean Air Act Amendments of 1977. The Prevention of Significant Deterioration regulations (PSD) as mandated by the Amendments require specific control measures be implemented at a new facility or on modification of an existing source. If this facility is located in an area of air quality standard nonattainment (NA) status or is predicted to significantly impact an NA area, even more stringent regulations and control procedures apply. For example, if the new source will operate in an area of recorded TSP violations, through the permitting process, implementation of a monitoring program, Best Available Control Technology, Lowest Achievable Emission Rates, and/or the Offset Policy may apply. The Offset Policy mandates that emissions from existing sources in the region must be reduced in an amount more than sufficient to offset emissions from the new sources.

Applicant Committed Measures

There are no air quality or climate mitigative measures committed subsequent to the filed mine plan. Since federal and state regulations (mining and reclamation, emissions, and air quality maintenance) require that best available control measures be included in the mine plans, they have been considered in the impact analysis (Chapter 3).

Monitoring and Research Programs

To develop a base for future mine impact analyses and ascertain attainment or nonattainment of Air Quality Standards, the operators would be required to provide a monitoring program. This would be for the purpose of determining both background concentration levels and total ambient levels (background plus mining impact). Therefore, the monitoring program would measure TSP levels both in the predominant upwind and downwind directions. As reclamation is accomplished, the compliance officers (state and federal) would conduct periodic inspections of mining areas to ensure reclamation is accomplished in accordance with an approved reclamation plan.

UNAVOIDABLE ADVERSE IMPACTS FOR NORTH BLOCK

For the North Block mine, no optional mitigative measures are proposed. All measures proposed in the mining plans are already included in the analysis. Therefore, all reductions in concentrations associated with mitigation have already been considered in the impacts reported in Chapter 3. Unavoidable adverse impacts are then equivalent to impacts discussed in Chapter 3.

Impacts on Air Quality

When annual average background particulate values of 16 $\mu g/m^3$ for 1980 and 15 $\mu g/m^3$ for all other years (see Chapter 4 of the Regional Technical Report* for how they were determined) are added to projected mine-related contributions, the annual primary NAAQS of 75 $\mu g/m^3$ is predicted to be exceeded (in the worst case) within 0, 1.0, 0.5, and 0.5 miles of the active site; and the annual Wyoming standard of 60 $\mu g/m^3$ is predicted to be exceeded within 0.5, 1, 1, and 1 mile of the active site for the years 1980, 1985, 1990, and EOML, respectively (see Table NB5-1).

If projected mine-related 24-hour SP values and background concentrations of 49 $\mu g/m^3$ for 1980 and 46 $\mu g/m^3$ for all other years are combined, the 24-hour primary NAAQS of 260 $\mu g/m^3$ is predicted to be exceeded within 1, 1.5, 1, and 1.5 miles of the active site; and the Wyoming standard of 150 $\mu g/m^3$ is predicted to be exceeded within 1, 2, 2, and 2.5 miles of the active site for the years 1980, 1985, 1990, and EOML, respectively. (These projections are based on worst-case meteorological conditions.)

A comparison of the worst-case mine impact with PSD regulations is shown in Table NB5-2. The distances from the mining area within which the specified regulations are predicted to be exceeded are listed for annual and 24-hour averages according to PSD area classification.

The predicted annual and 24-hour TSP concentrations discussed above and presented in Tables NB5-1 and NB5-2 are worst-case mine impacts. In addition, twenty-four hour impacts are based on worst-case meteorological conditions. Annual impacts assume a mining and reclamation schedule such that for approximately nine months of the year there is unreclaimed land subject to wind erosion. The "most probable" levels of emissions have been calculated based on these factors (see Chapter 3 for a more detailed discussion). The most probable emissions for the North Block mine in 1980 may be as little as 37% of the worst-case emissions.

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*Available at the Rock Springs District BLM office.

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TABLE NB5-1

DISTANCES FROM ACTIVE MINE SITE WITHIN WHICH AMBIENT AIR QUALITY STANDARDS FOR TSP ARE PREDICTED TO BE EXCEEDED

Averaging Time	Standard ($\mu g/m^3$)	Year			
		1980	1985	1990	EOML
24-hour	150*	1 mile	2 miles	2 miles	2.5 miles
	260**	1 mile	1.5 miles	1 mile	1.5 miles
Annual	60*	0.5 mile	1 mile	1 mile	1 mile
	75**	0 miles	0.5 mile	0.5 mile	0.5 mile

*Wyoming
**NAAQS

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TABLE NB5-2

DISTANCES FROM ACTIVE MINE SITE WITHIN WHICH
PSD REGULATIONS FOR TSP
ARE PREDICTED TO BE EXCEEDED

Averaging Time	Standard* ($\mu g/m^3$)	Year			
		1980	1985	1990	EOML
24-hour	37	2 miles	4 miles	4 miles	5 miles
Annual	19	1 miles	1.5 miles	1.5 miles	1.5 miles

*Area II classification

In addition to the sources of fugitive dust already listed, two other potential sources of significant particulate emissions are associated with the North Block mine: blasting and coal fires. The impact of these two sources is difficult to assess although the maximum air quality degradation would occur on a local scale. The cloud of dust produced by blasting would be short-lived, at least compared to the averaging times of the TSP standards (24 hours or greater), so that little contribution to 24-hour levels would be measured outside the mine site. Coal fires could occur in spite of mitigating measures taken to prevent them. If neglected and allowed to burn out of control for long periods, they could be a significant source of pollutants. Any fire on the site could significantly contaminate the air and cause a safety hazard. However, due to a high degree of fire control technologies, potential fire impacts would probably be minimal.

If reclamation fails because of a natural catastrophe and the area disturbed by mining operations is not revegetated, particulate emissions could be increased over all predicted emission levels presented in this report, although the magnitude of this increase in unknown.

Mine-related NO_x and SO_2 emissions are expected to be insignificant, as discussed in Chapter 4 of the Regional Statement Component; therefore, ambient pollutant concentrations have not been predicted.

Gaseous Pollutants

Recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines were reviewed to estimate the probable range of impact. Maximum predicted concentrations of CO ranged between 0.02 and 0.44% of the standard. Maximum predicted HC concentrations ranged between 0.88 and 3.44% of the standards. Maximum predicted NO_2 concentrations ranged between 0.60 and 3.0% of the standards. Maximum predicted concentrations of SO_2 ranged between 0.02 and 0.33% of the standards. The values represent predictions at less than one-half mile from the mines. Predictions were significantly less at further distances from the mines.

Visibility

For 1980, the visibility of an observer at 1 mile downwind would be approximately 39.9 miles, assuming a background visibility of 40 miles. In general, visibility will increase with downwind distance from the mine. At 5 miles downwind the visibility will be 39.9 miles, and at 10 miles it will reach 40 miles. The corresponding values, assuming a background visibility of 7 miles, are 7 miles, 7 miles, and 7 miles, respectively.

RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY FOR NORTH BLOCK

Short-term use of the environment (mining operations) will produce impacts that include generation of fugitive dust and gaseous pollutants (from vehicles) and some reduction in visibility.

The air pollution caused by the mine will be primarily a short-term phenomenon because most air quality impacts will cease when active mining and reclamation are completed. Short-term air quality impacts include fugitive dust generated by the mining activities, particulate emissions associated with blasting and coal fires, and reductions in visibility.

Air pollution from vehicle exhausts and fugitive dust emissions from access roads after the completion of mining will depend on the subsequent use of the land. Access to the property will have been established. Continued use of unpaved access roads could result in continuing emissions of fugitive dusts from wind erosion and gaseous pollutants from vehicle exhausts. If these impacts continue after EOML, they will be long-term impacts. Since subsequent land use is not known, the extent of these impacts cannot be quantified but is expected to be minimal. Minimal concentrations are anticipated because concentrations predicted during mine life based on traffic associated with mining operations is insignificant when compared to national standards. Traffic volume would have to increase significantly over that estimated at peak mining operations to substantially affect ambient concentrations in the future. Therefore, the short-term use of the natural resources (coal) is not expected to significantly affect long-term maintenance of air quality.

The proposed short-term use of the environment does not foreclose other additional long-term uses of the environment. That is, air quality will not be degraded after EOML, foreclosing the development of other industrial sources in the area (due to PSD allowable increments) or altering the air quality from its presently rural character.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES FOR NORTH BLOCK

Most air quality impacts associated with the North Block mine will be reversed when the land is reclaimed and returned to an equivalent of the pre-existing vegetative cover and general contours. The only long-term air quality impacts anticipated are those resulting from continued use of unpaved access roads after the project has been completed or halted. Since use of these roads could be stopped by blocking access or reclaiming roadbeds, no irreversible air quality impacts are predicted.

Irreversible meteorological impacts are anticipated. Local, insignificant changes in the microclimatology of the area would result from the redistribution of the surface material at the mine. (See Chapter 2 of the Regional Technical Report.*) Changes in contours and surface characteristics would irreversibly alter the wind field and surface heating of the air. For example, the divergent or convergent patterns of the surface winds would change according to the changes in small-scale surface contours. Changes in the composition of topsoil and vegetation could alter the absorption and radiation of solar heat.

Irretrievable air quality impacts will occur. The loss of good air quality for the period of the project cannot be retrieved. During the life of the project, TSP standards may be exceeded and visibility slightly reduced in the immediate vicinity of the project.

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*Available at the Rock Springs District BLM Office.

TWIN CREEK EXISTING CLIMATE

The proposed Twin Creek mining area is located in Lincoln County, approximately 2 miles west of Kemmerer and adjacent to the northeast flank of the Bear River Divide. The general account of the temperature and precipitation patterns given in the regional analysis describes the climate in the vicinity of Twin Creek.

Site-Specific Parameters

Sunshine

Since the Twin Creek mining area is situated in a high plains/foothills area, the annual percentage of possible sunshine is expected to approximate the 65% statewide average.

Wind

Utah Power & Light (UPL) owns a field network of four meteorological observation sites in the vicinity of its Naughton Power Plant, which is located near Kemmerer in Lincoln County and closer to the North Block mining area than the Fort Bridger National Weather Service (NWS) site used in the regional analysis. From a review of a one-year (1 August 74 to 1 September 75) compilation of surface wind statistics (Golden and Petersen 1976) at these sites, the predominant wind direction and speed characteristics observed are comparable to the climatological values at Fort Bridger (see Chapter 2 Regional Technical Report*). However, there are some discernible differences in the surface winds between the Fort Bridger and UPL sites, and they are outlined below.

Annually, the winds at each of the UPL sites show a greater tendency for directional variation. The three predominant wind direction sectors at three of the UPL sites are west through northwest and comprise 40% of the annual number of hourly observations. The fourth site indicates a predominant flow in the southwest through west sectors, which accounts for about 55% of all annual observations. Thus, the frequencies of

*Available at Rock Springs District BLM Office.

occurrence of the predominant wind direction sectors for each of the sites are somewhat lower than the 64% at Fort Bridger. In addition, secondary directional maxima associated with north through east sector winds are shown to occur at each of the UPL sites. There are no secondary maxima evident in the Fort Bridger data.

The annual average wind speeds at the UPL sites range from 8 to 13 mph, less than the 15 mph average at Fort Bridger.

Atmospheric Temperature and Stability

Similar to the entire ES region, the Twin Creek mining area is subject to large seasonal and diurnal temperature variations. Temperatures are expected to closely parallel those observed at Kemmerer, which indicate mean monthly minima/maxima of 5°F/29°F and 44°F/82°F during January and July, respectively. Temperature extremes should range from -32 to 97°F. The growing season is about 185 days per year.

Vertical temperature profiles were also obtained by UPL during seasonal field studies (Golden and Petersen 1976). Like the surface wind data, the vertical temperature profile obtained by UPL is similar to the climatological values determined for three NWS radiosonde sites and discussed in the regional analysis. However, some differences are notable.

Of all morning soundings (79 total), 85% contained some type of inversion (either surface-based or upper-level). The three NWS sites indicated about a 90% frequency. Of the UPL morning soundings, 65% had surface-based inversions with an average depth of 300 feet. Thus, the average depth and frequency of surface-based inversions in the vicinity of the proposed Twin Creek mining area is again somewhat lower than the approximate 800-foot average depth, which occurred with an 85% average frequency at the three NWS sites. This is probably because of faster wind speeds and/or lack of sheltering by large topographic barriers at the UPL locations, than at the NWS sites at Lander, Wyoming (in the lee of the Wind River Range), Grand Junction, Colorado (in the Gunnison River Valley), and Salt Lake City, upwind of the Wasatch Mountains, and affected by the stabilizing influences of the Great Basin High.

Only 11% of the afternoon soundings (after 12:00 A.M. LST) showed inversions of any type. Again, this value is somewhat lower than the 25 to 35% range indicated at the three NWS sites.

Precipitation

Annual average precipitation and total snowfall should approximate the climatological values of 9 inches and 55 inches, respectively, observed at Kemmerer.

Evapotranspiration

An annual soil moisture deficit of about 10 inches noted for Kemmerer in the regional analysis should be characteristic of the Twin Creek mining area. The growing season roughly coincides with the period of high soil moisture deficit.

Severe Weather Events

The number of thunderstorm and hail days should be about 30 and 3 per year, respectively. The likelihood of tornadoes occurring in this region is very low.

Future Climate

It is not anticipated that the local climatology will change over the next fifteen years.

TWIN CREEK EXISTING AIR QUALITY

The proposed Twin Creek site is not in the prevailing downwind direction of pollutant dispersion from Kemmerer. Therefore, the present air quality at this location should have a rural character. Consequently, the existing TSP levels at this site should range from 10 to 20 $\mu g/m^3$ annually and 30 to 45 $\mu g/m^3$ for 24 hours. The magnitude of these levels is less than one-third of the appropriate state standards. Based on five years of visual observations recorded at Fort Bridger, Wyoming, a representative background visual range in the vicinity of the Twin Creek site should be approximately 40 miles.

Concentrations of SO_2 around Twin Creek should also reflect its rural setting; i.e., levels less than 5 $\mu g/m^3$ annually and less than 25 $\mu g/m^3$ for daily averaging period. The magnitude of these concentrations is only about 10% of the annual and 24-hour state standards. In addition, annual NO_2 concentrations should be less than 10 $\mu g/m^3$, or again only 10% of the standard.

Future Environment of Twin Creek Without the Proposed Action

If the proposed mining does not occur, it is anticipated that future regional TSP, SO_2, and NO_2 levels will be similar to existing concentrations through the year 1990.

The expansion of the Naughton Power Plant, however, may have a local effect on air quality near the proposed Twin Creek mine site; but this should be minimal. Although the expanded facility is expected to increase TSP emission by 262 pounds per hour ($\sim$17%), SO_2 emissions by 1,094 pounds per hour (5%), and NO_x emissions by 7,280 pounds per hour ($\sim$50%), ambient air concentrations should not change appreciably at the proposed mine site. Figures SC2-3 and SC2-4 indicate the magnitude and spatial distribution of future TSP levels in the vicinity of the Twin Creek mine site.

Future visibility at this location should remain similar to existing visibility.

TWIN CREEK AIR QUALITY IMPACTS

Emissions from the Proposed Mine

Particulate emissions from individual mining activities were calculated using emission factors developed in recent studies of fugitive dust sources from mining (EPA 1977; PEDCO 1976). These factors require estimates of coal production rates, overburden removal, haulage distances, employee access distances, vehicular speeds, and disturbed acreage. In addition, some of the factors require correction for soil silt content and climatic conditions. Estimates of operational parameters were obtained from the mining plan and from personal communications with mining engineers. Soil silt content was determined through consultation with the U.S. Department of Agriculture and the BLM. Climatic factors were estimated from local and regional climatological surveys. All formulas and data used in the emission calculations as well as inherent uncertainties are given in Chapter 4 of the Regional Technical Report*. Emission estimates for the different source activities with the mine at full operation are given in Table TC3-1 for 1980, 1985, 1990, and end of mine life (EOML).

The emissions burden projections presented in Table TC3-1 represent a conservative (upper bound) assessment of the impact of the proposed mine. This conservatism assumes that minimal dust controls would be applied to each mine activity. Therefore, to indicate the range of TSP impact that might be expected from variations in operating practices, emission burdens were also estimated for a more probable situation, where more stringent measures would be implemented for wind erosion control at the surface mines. These control measures are to be regarded as measures that may eventually be implemented by the mines (not mitigative measures).

For the contribution of wind erosion from unreclaimed and partially reclaimed land, the most probable situation would be represented by mulching and furrowing in the Spring, followed by Fall planting. Note that the projected emissions (Table TC3-1) were based on the assumption that mulching and planting would be performed in the Fall in a one-step operation. Surface roughness impediments to erosion (furrowing), moreover, were neglected in that analysis.

Results of the most probable analysis are presented in Table TC3-2. The slight variations among the factors that account for the emissions reduction achieved by Spring furrowing and mulching (versus Fall mulching and no furrowing) result from differences in predominant soil types, climatic factors, and reclamation schedules among the four surface mines.

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*Available at the Rock Springs District BLM Office.

TABLE TC3-1

TWIN CREEK PARTICULATE EMISSIONS

	TSP (Tons per Year)			
	1980	1985	1990	EOML
Overburden Removal	648	648	648	648
Ore Loading	125	125	125	125
Truck Dumping	25	25	25	25
Train Loading	2.5	2.5	2.5	2.5
Conveying	12.5	12.5	12.5	12.5
Coal Storage	0.7	0.7	0.7	0.7
Crushing (Primary)	1.2	1.2	1.2	1.2
Crushing (Secondary)	4	4	4	4
Overburden Dump Disturbance	255	180	0	0
Employee Access Roads	1.4	1.1	1.1	1.1
Haul Roads (Coal)	105	105	158	158
Haul Roads (Overburden)	359	222	0	0
Haul Road Repair	56	56	56	56
Dozers (Overburden Dumps)	81	81	81	81
Wind Erosion	729	1,702	1,434	415
Totals	2,405	3,166	2,549	1,530

TABLE TC3-2

MOST PROBABLE PARTICULATE EMISSIONS ESTIMATES FOR TWIN CREEK

Year	Total Projected Emissions from Table SH3-1 (tons per year)	Reduction of Wind Erosion Emissions from Spring Mulching and Furrowing		Most Probable Emissions (tons per year)	Overall Percent Reduction from Projected Emissions
		Reduction Factor*	Emissions Reduction (tons per year)		
1980	2,405	0.72	525	1,880	22
1985	3,166	0.72	1,225	1,941	39
1990	2,549	0.72	1,032	1,517	40
EOML	1,530	0.72	299	1,231	20

*Percent reduction = 100 x (reduction factor); furrowing factor K = 0.6, 2,000 pounds per acre of mulch assumed to be applied on April 15 of the analysis year.

From the final column of the table, it is apparent that, during the analysis years representing the more typical levels of coal production and mine operation (1985 and 1990), the "most probable" estimates are 39 to 40% less than the more conservative "projected emissions" for the Twin Creek mine. The lack of reliability of the most recently published fugitive dust emission factors for coal mines (EPA 1977) and the variability of such factors may be at least as great as the actual range of emissions implied by the figures in Table TC3-2.

Impact on Air Quality

To assess the impact of the mine on the atmospheric environment, estimates must be made of the ambient suspended particulate (SP) concentrations resulting from the mine emissions. To accomplish this, an atmospheric diffusion model has been applied to the mine site. The effect of local emissions is considered in the model both over a long period of time (annual average) and for short-duration exposures (daily averages). All of the emissions from the mine have been added to represent a single source originating across the entire mining area. This area source is considered to be the annual disturbed acreage for modeling of annual averages and 25 acres for modeling of daily averages. This is a reasonable representation considering the wide variations in individual emission points during mining operations. However, for some mines more than 25 acres may be operationally active during any particular 24-hour period. Increasing the size of the area source as much as tenfold would serve to decrease predicted SP concentrations within approximately 1 mile of the mine site but would have little effect further downwind.

Meteorological input to annual average computations consisted of a stability wind rose derived from five years of observations at Rock Springs. Concentrations were calculated for 480 possible weather conditions and weighted by their frequency over a year. The worst-case wind direction was identified as west due to its high frequency of lower wind speeds that result in high ground-level concentrations. To model worst-case 24-hour concentrations, it was assumed that a wind speed of 4 miles per hour (mph) and a stable atmosphere persisted for 12 hours, followed by a wind speed of 4 mph and a neutral atmosphere persisting for 4 hours, under a northwest wind for the 16-hour period. No mine impact was assumed for the other 8 hours. Such conditions were derived from five years (1950 to 1954) of Fort Bridger persistence data and represent worst-case meteorology for 24-hour modeling analyses.

Prior to evaluation of the simulated mine results, the reader is reminded of the serious limitations inherent in the state-of-the-art emission factors as well as the uncertainties associated with the modeling of fugitive dust emissions. A complete description of the modeling analysis and inherent uncertainties is presented in Chapter 4 of the Regional Technical Report.

Figures TC3-1 through TC3-4 show the mine-related SP concentrations for worst-case annual and 24-hour averages predicted by the model. Concentrations are shown to decrease rapidly with distance. Annual and 24-hour mine-related concentrations decrease to 10% of maximum values at 1.5 to 3 miles and 1.5 to 2 miles downwind of the mine, respectively.

The worst-case SP concentrations shown in Figures TC3-1 through TC3-4 may be scaled to most probable SP values by multiplying each worst-case concentration by the ratio of most probable emissions to worst-case emissions. For example, using the overall percent reduction from projected worst-case emissions (hence concentrations) of 39% for 1985 in Table TC3-2, the worst-case annual concentration of 34 $\mu g/m^3$ and 24-hour concentration of 338 $\mu g/m^3$ at a receptor located 2 miles from the mine would decrease to 21 $\mu g/m^3$ and 206 $\mu g/m^3$, respectively. The decrease in mine-related concentrations implies that projected concentrations greater than the standards for the most probable emissions would not occur as far downwind of the mine as worst-case emissions.

When annual average background particulate values of 16 $\mu g/m^3$ for 1980 and 15 $\mu g/m^3$ for all other years (see Chapter 4 Regional Technical Report for how they were determined) are added to projected mine-related contributions, total levels are predicted to be greater than the annual primary NAAQS of 75 $\mu g/m^3$ within 1.5, 1.5, 1, and 1 miles and greater than the annual Wyoming standard of 60 $\mu g/m^3$ within 1.5, 1.5, 1.5, and 1 miles of the mine for the years 1980, 1985, 1990, and EOML, respectively. Background concentrations are projected to contribute 70% to total TSP levels at 3 to 5.5 miles and 7 to 13.5 miles downwind from the mine for annual and 24-hour averaging periods, respectively.

If projected mine-related 24-hour SP values and background concentrations of 49 $\mu g/m^3$ for 1980 and 46 $\mu g/m^3$ for all other years are combined, concentrations are predicted to be greater than the 24-hour primary NAAQS of 260 $\mu g/m^3$ within 2.5, 2.5, 2.5, and 2 miles, and greater than the Wyoming standard of 150 $\mu g/m^3$ within 4, 4.5, 4, and 2.5 miles of the mine for the years 1980, 1985, 1990, and EOML, respectively.

A comparison of the worst-case mine impact with PSD regulations is shown in Table TC3-3. The distances from the mining area within which predicted concentrations are higher than the specified increments are listed for annual and 24-hour averages according to PSD area classification. Concentrations greater than the Class II annual PSD increment are projected to occur within 1.5 to 3 miles and greater than the 24-hour increment within 5.5 to 9.5 miles of the mine.

The impact of blasting and coal fires is difficult to assess, although the maximum air quality degradation would occur on a local scale. The cloud of dust produced by blasting would be short-lived, at least compared to the averaging times of the TSP standards (24 hours or greater), so that little contribution to 24-hour levels would be measured outside the mine site. The dust produced would also be initially dispersed to a great degree by the force of the blast. Blasting would generally take place during the day, when meteorological characteristics

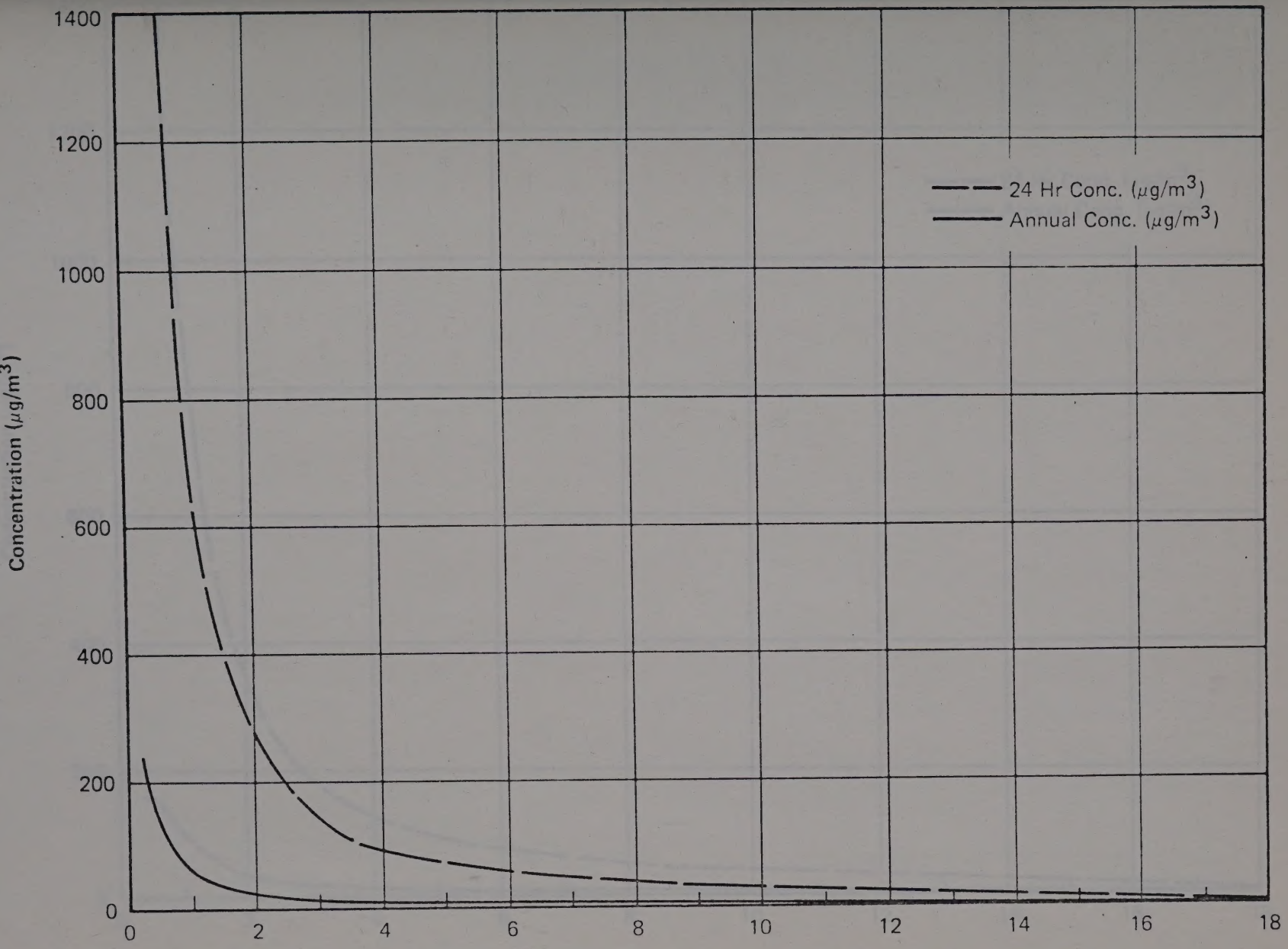


Figure TC3-1

1980 Twin Creek SP Concentrations

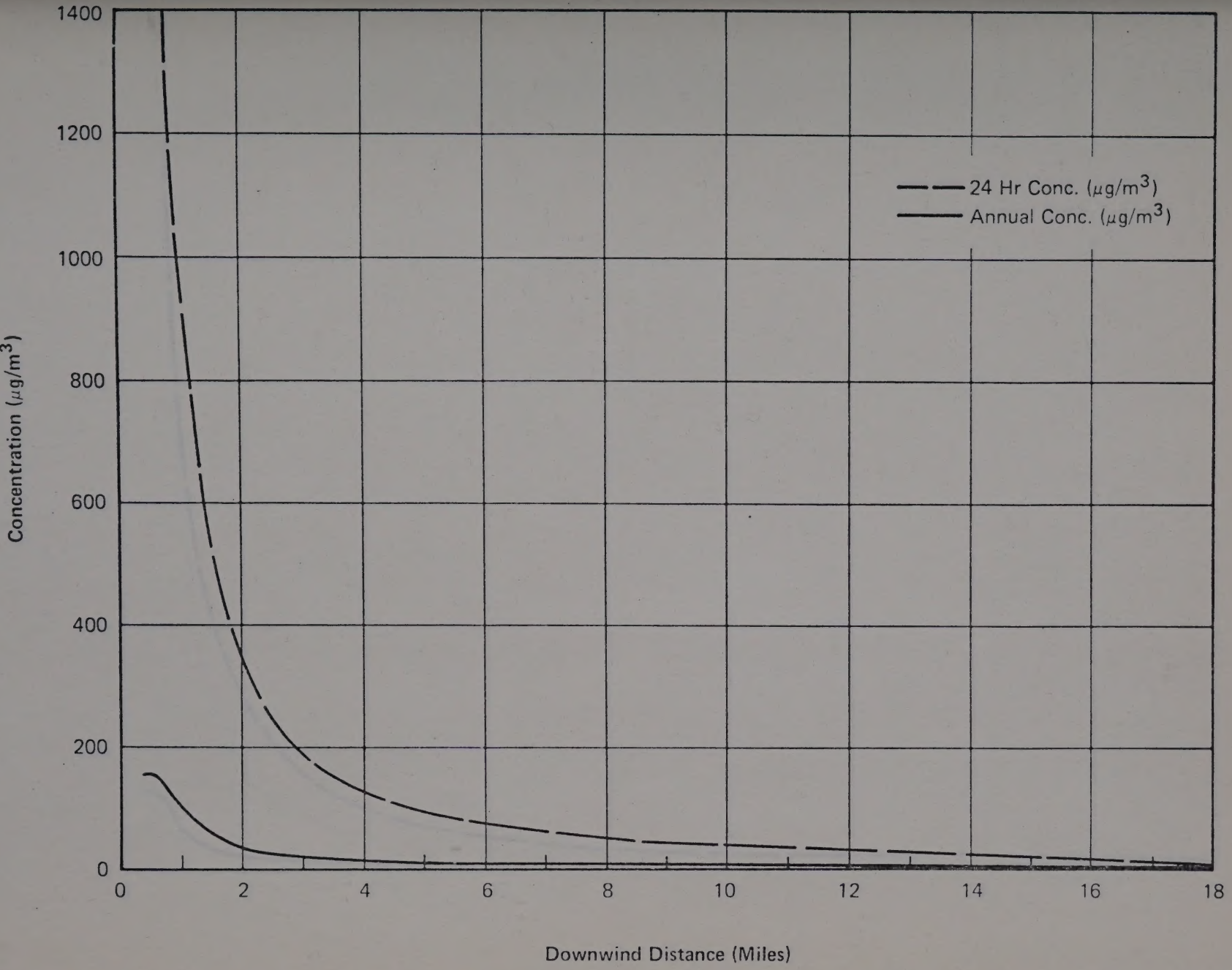
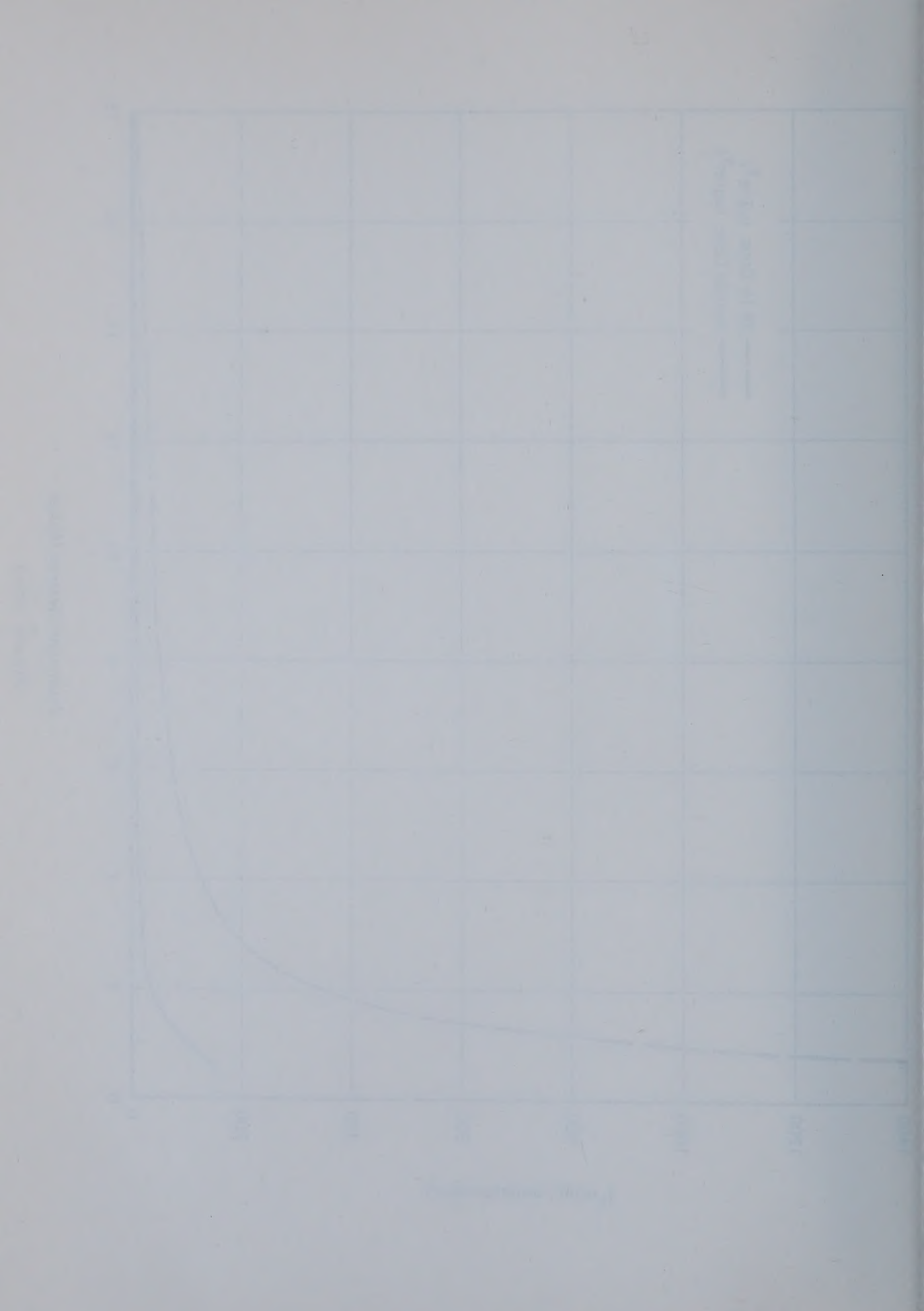


Figure TC3-2

1985 Twin Creek SP Concentrations



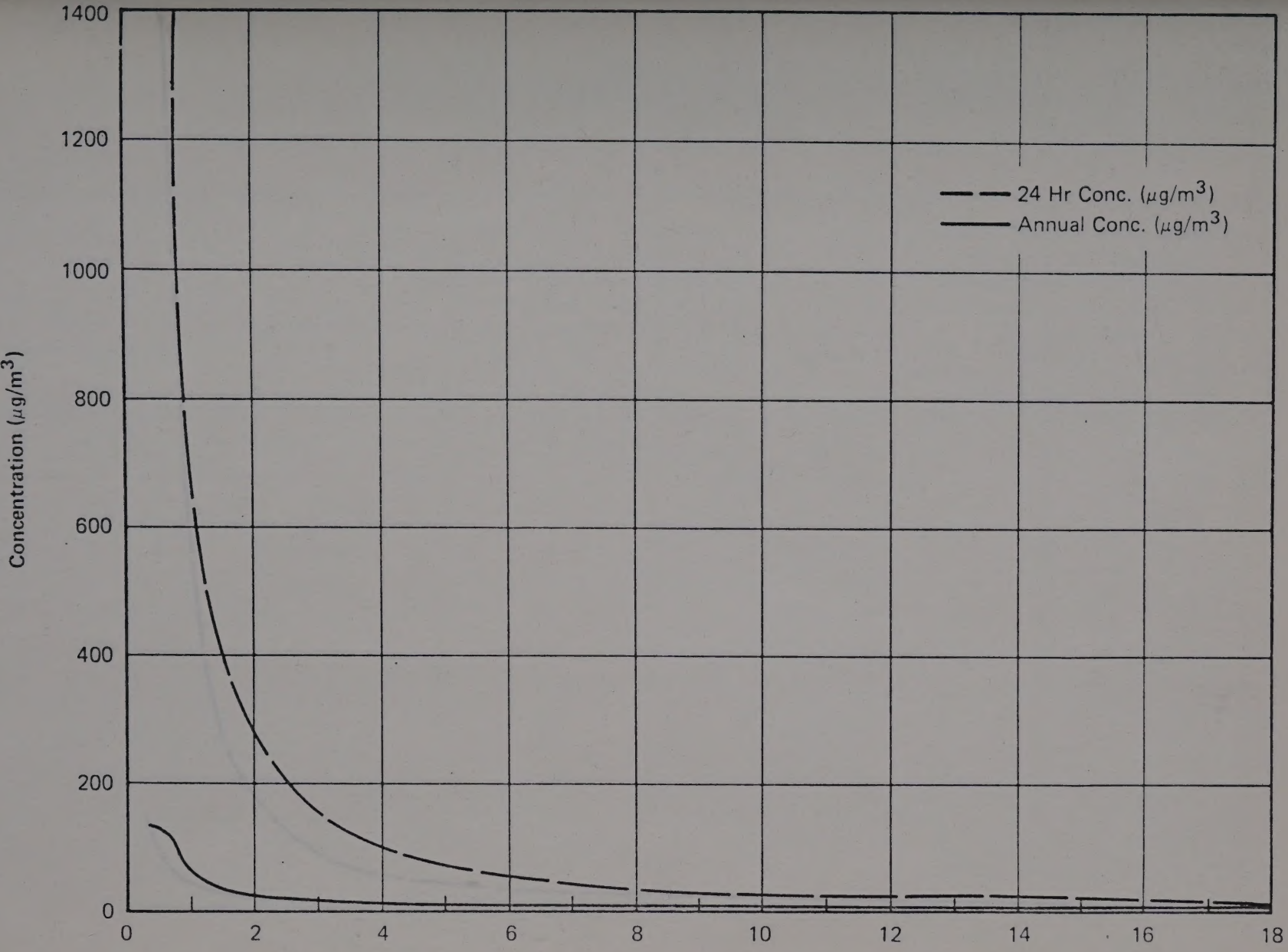


Figure TC3-3

1990 Twin Creek SP Concentrations

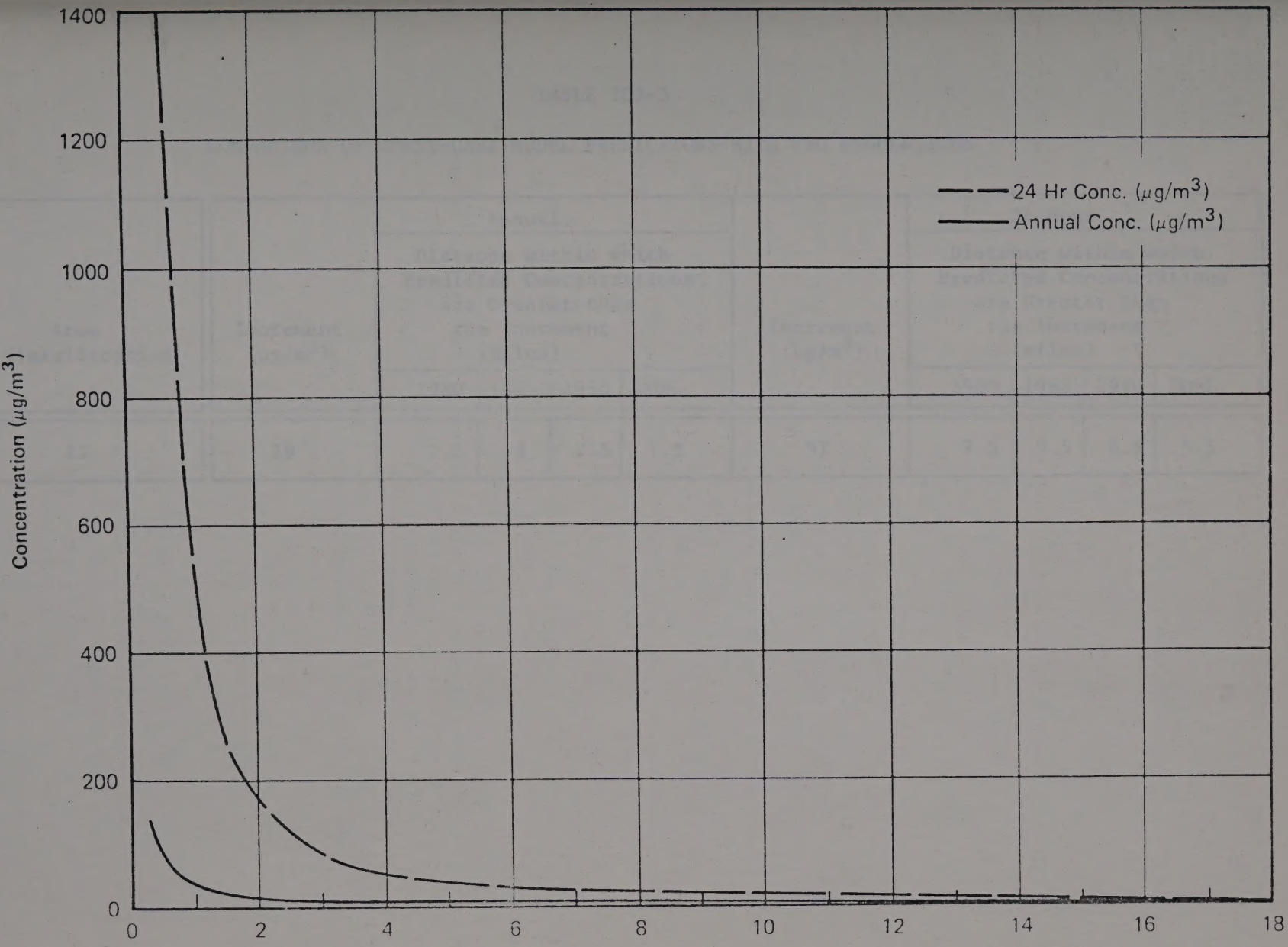


Figure TC3-4

EOML Twin Creek SP Concentrations

TABLE TC3-3

COMPARISON OF WORST-CASE MODEL PREDICTIONS WITH PSD REGULATIONS

Area Classification	Increment ($\mu g/m^3$)	Annual				Increment ($\mu g/m^3$)	24-Hour			
		Distance within which Predicted Concentrations are Greater than the Increment (miles)					Distance within which Predicted Concentrations are Greater than the Increment (miles)			
		1980	1985	1990	EOML		1980	1985	1990	EOML
II	19	2.5	3	2.5	1.5	37	7.5	9.5	8.5	5.5

are most favorable for dispersing ground-level pollutants. Coal fires could be a significant source of pollutants if neglected and allowed to burn out of control for long periods. Any fire on the site could significantly contaminate the air and cause a safety hazard. However, due to the high degree of fire control technologies, potential fire impacts would probably be minimal.

Gaseous Pollutants

Vehicle emissions would be the only source of gaseous air pollutants from the proposed mine. Federal and state regulations include limitations on ambient air concentrations of the vehicle-related pollutants CO, HC, NO_2, and SO_2.

The air quality impact of the emission of these pollutants would be greatest closest to the mine since all emissions would be at ground-level. Ambient concentrations were not modeled because of the lack of detailed data on vehicle use and of applicable background data for these pollutants. However, recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines were reviewed to estimate the probable range of impact. In these studies, concentrations of the above pollutants for similar mining operations had either been modeled or estimated from standard approximation techniques. In all cases, the levels of maximum pollutant concentrations from vehicle emissions were insignificant when compared to standards.

Maximum predicted concentrations of CO ranged between 0.02 and 0.44% of the standard. Maximum predicted HC concentrations ranged between 0.88 and 3.44% of the standard. Maximum predicted NO_2 concentrations ranged between 0.60 and 3.0% of the standards. Maximum predicted concentrations of SO_2 ranged between 0.02 and 0.33% of the standards. The values represent predictions at less than one-half mile from the mines. Predictions were significantly less at further distances from the mines. Assuming similar vehicle activity for all western coal mines, the impact of vehicle emissions on ambient concentrations of gaseous pollutants would be minimal and insignificant compared to their respective standards.

Visibility

The ability of an observer to discern distant objects will be constrained by the capacity of the intervening atmosphere to absorb and scatter visible light within one's field of view. These atmospheric extinction properties and their corresponding effect on visibility degradation depend, in a complicated manner, on the optical nature of ambient molecules, aerosols, and particulates within the line of sight. Additional anthropogenic sources of particulates, such as those attributable to fugitive dust emissions, will reduce visibility in the immediate

source area. Precise evaluation of the degree of visibility degradation requires a knowledge of several parameters, such as the characteristic particulate number size distribution and the optical properties of particulates within each size range. Such data are generally not available. However, by employing reasonable assumptions an estimate of the visibility impact may be derived using TSP concentrations.

The hypothetical observer is positioned such that one's line of sight is perpendicular to the average wind direction across the plume within a 22.5° sector. For each year considered, the ERTAQ-simulated downwind SP concentrations ($\mu g/m^3$) (given in Figures TC3-1 through TC3-4) are partitioned by mass into both coal and soil fractions based on the annual emissions summary for each mining process. An appropriate number size distribution is assumed for windblown particulates normalized per unit mass concentration. Sixty percent of the TSP is assumed to populate the optically significant size range. Contributions to the total plume visibility degradation are computed for each fraction using its optical properties and scaling normalized results by the TSP concentrations. Results are presented for each year assuming background visibilities of both 40 miles and 7 miles, the latter characteristic of weather induced visibility degradation. A complete technical description is given in Chapter 4 of the Regional Technical Report.

Using this technique visibilities are computed downwind from the source. Results for worst-case 24-hour SP concentrations for the years 1980, 1985, 1990, and EOML are shown in Table TC3-4. Also given are the mass fractions of the total TSP for coal and soil for each year. For 1980, the visibility of an observer at 1 mile downwind would be approximately 39.1 miles, assuming a background visibility of 40 miles. In general, visibility will increase with downwind distance from the mine. At 5 miles downwind, the visibility will be 39.6 miles, and at 10 miles it will reach 39.7 miles. The corresponding values, assuming a background visibility of 7 miles, are 6.8 miles, 6.9 miles, and 6.9 miles, respectively. Additional years are given in the table.

TABLE TC3-4

ACROSS PLUME VISIBILITY DEGRADATION FOR THE PROPOSED TWIN CREEK MINE

Year	Visibility Downwind							
	Mass Fraction		Background 40 Miles			Background 7 Miles		
	Coal	Soil	1 Mile	5 Miles	10 Miles	1 Mile	5 Miles	10 Miles
1980	7	93	39.1	39.6	39.7	6.8	6.9	6.9
1985	6	94	38.8	39.5	39.6	6.8	6.9	6.9
1990	7	93	39.0	39.6	39.7	6.8	6.9	6.9
EOML	12	88	39.4	39.6	39.7	6.9	6.9	7.0

AIR QUALITY MITIGATING MEASURES NOT INCLUDED IN THE PROPOSED ACTION

The measures that will be taken to reduce the impact of the proposed mining activities must be enforceable under state and federal laws and regulations. Appropriate laws include the Clean Air Act of 1970 (U.S. Congress 1970), the Clean Air Act Amendments of 1977, (U.S. Congress 1977), the Wyoming Air Quality Standards and Regulations (Wyoming Statutes 1972), and the Surface Mining Control and Reclamation Act of 1977 (PL 95-87).

Measures Required by Federal Agencies

Office of Surface Mining

Before approval of mining and reclamation plans is granted, the mine plan must demonstrate performance standards that ensure removing the amount maximum of the coal resource; restoring the condition of the mined land; stabilizing surface areas to control erosion and, hence, emissions of fugitive dust; removing topsoil; restoring topsoil; and establishing a permanent vegetative cover for post-mining land-use.

Bureau of Land Management (BLM) and U.S. Geological Survey (USGS)

Enforceable procedures have been provided to ensure that adequate measures are taken during exploration of surface mining of federal coal to avoid, minimize, or correct damages to the environment, including air. Also implemented by the BLM and USGS are procedures to conduct leasing and subsequent management of federal coal, as well as regulations governing operations for discovering, testing, developing, mining, and preparing federal coal.

Environmental Protection Agency (EPA)

Mandated by the Clean Air Act of 1970, Wyoming is responsible for ensuring air quality within its borders and for specifying achievement and maintenance strategies. While the ultimate authority for enforcing the air pollution regulations rests with the EPA, this authority is only exercised when enforcement by the state environmental quality departments fails.

State and Local Agencies

Wyoming Department of Environmental Quality (DEQ)

To ensure that the ambient air quality standards will not be exceeded, the Wyoming DEQ must approve the construction and/or modification and the operation of any facility that will have an impact on air quality (Section 21, Wyoming Statutes 1972). The approval process involves an evaluation of the expected impact on the ambient air quality. The Wyoming DEQ, Division of Air Quality, also generally requires the establishment of a monitoring program to gather data concerning the ambient air quality as a result of the operation of the new or modified facility.

The Air Quality Division is legally required to ensure maintenance of the Air Quality Standards; and, therefore, they are required to ensure that mitigating measures are practiced. This is done as a matter of course through the permit and enforcement procedures. For instance, if the ambient monitoring system reveals that fugitive dust is causing excessive ambient TSP concentrations, the Wyoming DEQ could require any of the following control measures (Section 14, Wyoming Statutes 1972):

"The emission of fugitive dust shall be limited by all persons handling, transporting, or storing any material to prevent unnecessary amounts of particulate matter from becoming airborne to the extent that ambient air standards described in these regulations are exceeded. Control measures described as follows or any equivalent method shall be considered appropriate for such control.

1) use, where possible, of water or chemicals for control of dust in the demolition of existing buildings, or structures, construction operations, the grading of roads or the clearing of land;

2) application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which can give rise to airborne dusts;

3) installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials; adequate containment methods shall be employed during sandblasting or other similar operations;

4) covering, at all times when in motion, open-bodied trucks, transporting materials likely to give rise to airborne dust;

5) conduct of agricultural practices such as tilling of land, application of fertilizers, etcetera, in such a manner as to prevent dust from becoming airborne;

6) the paving of roadways and their maintenance in a clear condition;

7) the prompt removal of earth or other material from paved streets onto which earth or other material has been transported by trucking or earth moving equipment, erosion by water, or other means."

These control measures are further enforced by the Clean Air Act Amendments of 1977. The Prevention of Significant Deterioration regulations (PSD) as mandated by the Amendments require specific control measures be implemented at a new facility or on modification of an existing source. If this facility is located in an area of air quality standard nonattainment (NA) status or is predicted to significantly impact an NA area, even more stringent regulations and control procedures apply. For example, if the new source will operate in an area of recorded TSP violations, through the permitting process, implementation of a monitoring program, Best Available Control Technology, Lowest Achievable Emission Rates, and/or the Offset Policy may apply. The Offset Policy mandates that emissions from existing sources in the region must be reduced in an amount more than sufficient to offset emissions from the new sources.

Applicant Committed Measures

There are no air quality or climate mitigative measures committed subsequent to the filed mine plan. Since federal and state regulations (mining and reclamation, emissions, and air quality maintenance) require that best available control measures be included in the mine plans, they have been considered in the impact analysis (Chapter 3).

Monitoring and Research Programs

To develop a base for future mine impact analyses and ascertain attainment or nonattainment of Air Quality Standards, the operators would be required to provide a monitoring program. This would be for the purpose of determining both background concentration levels and total ambient levels (background plus mining impact). Therefore, the monitoring program would measure TSP levels both in the predominant upwind and downwind directions. As reclamation is accomplished, the compliance officers (state and federal) would conduct periodic inspections of mining areas to ensure reclamation is accomplished in accordance with an approved reclamation plan.

UNAVOIDABLE ADVERSE IMPACTS FOR TWIN CREEK

For the Twin Creek mine, no optional mitigative measures are proposed. All measures proposed in the mining plans are already included in the analysis. Therefore, all reductions in concentrations associated with mitigation have already been considered in the impacts reported in Chapter 3. Unavoidable adverse impacts are then equivalent to impacts discussed in Chapter 3.

Impacts on Air Quality

When annual average background particulate values of 16 $\mu g/m^3$ for 1980 and 15 $\mu g/m^3$ for all other years (see Chapter 4 of the Technical Report* for how they were determined) are added to projected mine-related contributions, the annual primary NAAQS of 75 $\mu g/m^3$ is predicted to be exceeded (in the worst case) within 1.5, 1.5, 1, and 1 miles of the active site; and the annual Wyoming standard of 60 $\mu g/m^3$ is predicted to be exceeded within 1.5, 1.5, 1.5, and 1 miles of the active site for the years 1980, 1985, 1990, and EOML, respectively (see Table TC5-1).

If projected mine-related 24-hour SP values and background concentrations of 49 $\mu g/m^3$ for 1980 and 46 $\mu g/m^3$ for all other years are combined, the 24-hour primary NAAQS of 260 $\mu g/m^3$ is predicted to be exceeded within 2.5, 2.5, 2.5 and 2 miles of the active site; and the Wyoming standard of 150 $\mu g/m^3$ is predicted to be exceeded within 4, 4.5, 4, and 2.5 miles of the active site for the years 1980, 1985, 1990, and EOML, respectively. (These projections are based on worst-case meteorological conditions.)

A comparison of the worst-case mine impact with PSD regulations is shown in Table TC5-2. The distances from the mining area within which the specified regulations are predicted to be exceeded are listed for annual and 24-hour averages according to PSD area classification.

The predicted annual and 24-hour TSP concentrations discussed above and presented in Tables TC5-1 and TC5-2 are worst-case mine impacts. In addition, twenty-four hour impacts are based on worst-case meteorological conditions. Annual impacts assume a mining and reclamation schedule such that for approximately nine months of the year there is unreclaimed land subject to wind erosion. The "most probable" levels of emissions have been calculated based on these factors (see Chapter 3 for a more detailed discussion). The most probable emissions for the Twin Creek mine in 1990 may be 60% of the worst-case emissions.

*Available at the Rock Springs District BLM Office.

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TABLE TC5-1

DISTANCES FROM ACTIVE MINE SITE WITHIN WHICH
AMBIENT AIR QUALITY STANDARDS FOR TSP ARE PREDICTED
TO BE EXCEEDED

Averaging Time	Standard ($\mu g/m^3$)	Year			
		1980	1985	1990	EOML
24-hour	150*	4 miles	4.5 miles	4 miles	2.5 miles
	260**	2.5 miles	2.5 miles	2.5 miles	2 miles
Annual	60*	1.5 miles	1.5 miles	1.5 miles	1 mile
	75**	1.5 miles	1.5 miles	1 mile	1 mile

*Wyoming
**NAAQS

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TABLE TC5-2

DISTANCES FROM ACTIVE MINE SITE WITHIN WHICH
PSD REGULATIONS FOR TSP
ARE PREDICTED TO BE EXCEEDED

Averaging Time	Standard* ($\mu g/m^3$)	Year			EOML
		1980	1985	1990	
24-hour	37	7.5 miles	9.5 miles	8.5 miles	5.5 miles
Annual	19	2.5 miles	3 miles	2.5 miles	1.5 miles

*Area II classification

In addition to the sources of fugitive dust already listed, two other potential sources of significant particulate emissions are associated with the Twin Creek mine: blasting and coal fires. The impact of these two sources is difficult to assess although the maximum air quality degradation would occur on a local scale. The cloud of dust produced by blasting would be short-lived, at least compared to the averaging times of the TSP standards (24 hours or greater), so that little contribution to 24-hour levels would be measured outside the mine site. Coal fires could occur in spite of mitigating measures taken to prevent them. If neglected and allowed to burn out of control for long periods, they could be a significant source of pollutants. Any fire on the site could significantly contaminate the air and cause a safety hazard. However, due to a high degree of fire control technologies, potential fire impacts would probably be minimal.

If reclamation fails because of a natural catastrophe and the area disturbed by mining operations is not revegetated, particulate emissions could be increased over all predicted emission levels presented in this report, although the magnitude of this increase is unknown.

Mine-related NO_x and SO_2 emissions are expected to be insignificant, as discussed in Chapter 4 of the Regional Statement Component; therefore, ambient pollutant concentrations have not been predicted.

Gaseous Pollutants

Recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines were reviewed to estimate the probable range of impact. Maximum predicted concentrations of CO ranged between 0.02 and 0.44% of the standard. Maximum predicted HC concentrations ranged between 0.88 and 3.44% of the standards. Maximum predicted NO_2 concentrations ranged between 0.60 and 3.0% of the standards. Maximum predicted concentrations of SO_2 ranged between 0.02 and 0.33% of the standards. The values represent predictions at less than one-half mile from the mines. Predictions were significantly less at further distances from the mines.

Visibility

For 1980, the visibility of an observer at 1 mile downwind would be approximately 39.1 miles, assuming a background visibility of 40 miles. In general, visibility will increase with downwind distance from the mine. At 5 miles downwind the visibility will be 39.6 miles, and at 10 miles it will reach 39.7 miles. The corresponding values, assuming a background visibility of 7 miles, are 6.8 miles, 6.9 miles, and 6.9 miles, respectively (see Table TC5-3).

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TABLE TC5-3

ACROSS PLUME VISIBILITY DEGRADATION FOR TWIN CREEK

Year	Visibility Downwind					
	Background 40 Miles			Background 7 Miles		
	1 Mile	5 Miles	10 Miles	1 Mile	5 Miles	10 Miles
1980	39.1	39.6	39.7	6.8	6.9	6.9
1985	38.8	39.5	39.6	6.8	6.9	6.9
1990	39.0	39.6	39.7	6.8	6.9	6.9
EOML	39.4	39.6	39.7	6.9	6.9	7.0

RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY FOR TWIN CREEK

Short-term use of the environment (mining operations) will produce impacts that include generation of fugitive dust and gaseous pollutants (from vehicles) and a reduction in visibility.

The air pollution caused by the mine will be primarily a short-term phenomenon because most air quality impacts will cease when active mining and reclamation are completed. Short-term air quality impacts include fugitive dust generated by the mining activities, particulate emissions associated with blasting and coal fires, and reductions in visibility.

Air pollution from vehicle exhausts and fugitive dust emissions from access roads after the completion of mining will depend on the subsequent use of the land. Access to the property will have been established. Continued use of unpaved access roads could result in continuing emissions of fugitive dusts from wind erosion and gaseous pollutants from vehicle exhausts. If these impacts continue after EOML, they will be long-term impacts. Since subsequent land use is not known, the extent of these impacts cannot be quantified but is expected to be minimal. Minimal concentrations are anticipated because concentrations predicted during mine life based on traffic associated with mining operations is insignificant when compared to national standards. Traffic volume would have to increase significantly over that estimated at peak mining operations to substantially affect ambient concentrations in the future. Therefore, the short-term use of the natural resources (coal) is not expected to significantly affect long-term maintenance of air quality.

The proposed short-term use of the environment does not foreclose other additional long-term uses of the environment. That is, air quality will not be degraded after EOML, foreclosing the development of other industrial sources in the area (due to PSD allowable increments) or altering the air quality from its presently rural character.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES FOR TWIN CREEK

Most air quality impacts associated with the Twin Creek mine will be reversed when the land is reclaimed and returned to an equivalent of the pre-existing vegetative cover and general contours. The only long-term air quality impacts anticipated are those resulting from continued use of unpaved access roads after the project has been completed or halted. Since use of these roads could be stopped by blocking access or reclaiming roadbeds, no irreversible air quality impacts are predicted.

Irreversible meteorological impacts are anticipated. Local, insignificant changes in the microclimatology of the area would result from the redistribution of the surface material at the mine. (See Chapter 2 of the Regional Technical Report.*) Changes in contours and surface characteristics would irreversibly alter the wind field and surface heating of the air. For example, the divergent or convergent patterns of the surface winds would change according to the changes in small-scale surface contours. Changes in the composition of topsoil and vegetation could alter the absorption and radiation of solar heat.

Irretrievable air quality impacts will occur. The loss of good air quality for the period of the project cannot be retrieved. During the life of the project, TSP standards may be exceeded and visibility reduced in the immediate vicinity of the project.

*Available on the Rock Springs District BLM Office.

SOUTH HAYSTACK EXISTING CLIMATE

The proposed South Haystack mining area is located in Uinta County, approximately half-way between Evanston and Fort Bridger, Wyoming. The general account of the temperature and precipitation patterns given in the regional analysis describes the climate in the vicinity of South Haystack area.

Site-Specific Parameters

Sunshine

Since the South Haystack mining area is situated in a high plains/foothills area, the annual percentage of possible sunshine is expected to approximate the 65% statewide average.

Winds

Utah Power & Light (UPL) owns a field network of four meteorological observation sites in the vicinity of its Naughton Power Plant, which is located near Kemmerer in Lincoln County, about 25 miles north of the South Haystack mining area. From a review of a one-year (1 August 74 to 1 September 75) compilation of surface wind statistics (Golden and Petersen 1976) at these sites, the predominant wind direction and speed characteristics observed are comparable to the climatological values at Fort Bridger (see Chapter 2 Regional Technical Report*). However, there are some discernible differences in the surface winds between the Fort Bridger and UPL sites and they are outlined below.

Annually, the winds at each of the UPL sites show a greater tendency for directional variation. The three predominant wind direction sectors at three of the UPL sites are west through northwest and comprise 40% of the annual number of hourly observations. The fourth site indicates a predominant flow in the southwest through west sectors, which accounts for about 55% of all annual observations. Thus, the frequencies of occurrence of the predominant wind direction sectors for

*Available at the Rock Springs District BLM Office.

each of the sites are somewhat lower than the 64% at Fort Bridger. In addition, secondary directional maxima associated with north through east sector winds are shown to occur at each of the UPL sites. There are no secondary maxima evident in the Fort Bridger data.

The annual average wind speeds at the UPL sites range from 8 to 13 mph, less than the 15 mph average at Fort Bridger.

Atmospheric Temperature and Stability

Similar to the entire ES region, the South Haystack mining area is subject to large seasonal and diurnal temperature variations. Temperatures are expected to closely parallel those observed at Kemmerer, which indicate mean monthly minima/maxima of 5°F/29°F and 44°F/82°F during January and July, respectively. Temperature extremes should range from -32 to 97°F. The growing season is about 185 days per year.

Vertical temperature profiles were also obtained by UPL during seasonal field studies (Golden and Petersen 1976). Like the surface wind data, the vertical temperature profile obtained by UPL is similar to the climatological values determined for three NWS radiosonde sites and discussed in the Chapter 2 regional analysis. However, some differences are notable.

Of all morning soundings (79 total), 85% contained some type of inversion (either surface-based or upper-level). The three NWS sites indicated about a 90% frequency. Of the UPL morning soundings, 65% had surface-based inversions with an average depth of 300 feet. Thus, the average depth and frequency of surface-based inversions in the vicinity of the proposed South Haystack mining area is again somewhat lower than the approximate 800-foot average depth, which occurred with an 85% average frequency at the three NWS sites. This is probably because of faster wind speeds and/or lack of sheltering by large topographic barriers at the UPL locations, than at the NWS sites at Lander, Wyoming (in the lee of the Wind River Range), Grand Junction, Colorado (in the Gunnison River Valley), and Salt Lake City, upwind of the Wasatch Mountains and affected by the stabilizing influence of the Great Basin High.

Only 11% of the afternoon soundings (after 12:00 A.M. LST) showed inversions of any type. Again, this value is somewhat lower than the 25 to 35% range indicated at the three NWS sites.

Precipitation

Annual average precipitation and total snowfall should approximate the climatological values of 9 and 55 inches, respectively, observed at Kemmerer.

Evapotranspiration

An annual soil moisture deficit of about 10 inches noted for Kemmerer in the Chapter 2 Regional Technical Report should be characteristic of the South Haystack mining area. The growing season roughly coincides with the period of high soil moisture deficit.

Severe Weather Events

The number of thunderstorm and hail days should be about 30 and 3 per year, respectively. The likelihood of tornadoes occurring in this region is very low.

Future Climate

It is not anticipated that the local climatology will change over the next fifteen years.

SOUTH HAYSTACK EXISTING AIR QUALITY

The proposed South Haystack site is not in the prevailing downwind direction of pollutant dispersion from Kemmerer. Therefore, the present air quality at this location should have a rural character. Consequently, the existing TSP levels at this site should range from 10 to 20 $\mu g/m^3$ annually and 30 to 45 $\mu g/m^3$ for 24 hours. The magnitude of these levels are less than one-third of the appropriate state standards. Based on five years of visual observations recorded at Fort Bridger, Wyoming, a representative background visual range in the vicinity of the South Haystack site should be approximately 40 miles.

Concentrations of SO_2 around South Haystack should also reflect its rural setting; i.e., levels less than 5 $\mu g/m^3$ annually and less than 25 $\mu g/m^3$ with respect to a daily averaging period. The magnitude of these concentrations is only about 10% of the annual and 24-hour state standard. In addition, annual NO_2 concentrations should be less than 10 $\mu g/m^3$, again only 10% of the standard.

Future Environment at South Haystack Without the Proposed Action

If the proposed mining does not occur, it is anticipated that future regional TSP, SO_2, and NO_2 levels through the year 1990 will be similar to existing concentrations. No major increase in industrial activity, local construction, or traffic is expected to occur in the immediate vicinity of the proposed South Haystack mine site during this period, so air quality in this area should also show little change. Figures SC2-3 and SC2-4 indicate the magnitude and spatial distribution of future TSP levels at the proposed South Haystack mine site.

Future visibility at this location should remain similar to existing visibility.

SOUTH HAYSTACK AIR QUALITY IMPACTS

Emissions from the Proposed Mine

Particulate emissions from individual mining activities were calculated using emission factors developed in recent studies of fugitive dust sources from mining (EPA 1977; PEDCo 1976). These factors require estimates of coal production rates, overburden removal, haulage distances, employee access distances, vehicular speeds, and disturbed acreage. In addition, some of the factors require correction for soil silt content and climatic conditions. Estimates of operational parameters were obtained from the mining plan and from personal communications with mining engineers. Soil silt content was determined through consultation with the U.S. Department of Agriculture and the BLM. Climatic factors were estimated from local and regional climatological surveys. All formulas and data used in the emission calculations as well as inherent uncertainties are given in Chapter 4 of the Regional Technical Report.* Emission estimates for the different source activities with the mine at full operation are given in Table SH3-1 for 1980, 1985, 1990, and end of mine life (EOML).

The emissions burden projections presented in Table SH3-1 represent a conservative (upper bound) assessment of the impact of the proposed mine. This conservatism assumes that minimal dust controls would be applied to each mine activity. Therefore, to indicate the range of TSP impact that might be expected from variations in operating practices, emission burdens were also estimated for a more probable situation, where more stringent measures would be implemented for wind erosion control at the surface mines. These control measures are to be regarded as measures that may eventually be implemented by the mines (not mitigative measures).

For the contribution of wind erosion from unreclaimed and partially reclaimed land, the most probable situation would be represented by mulching and furrowing in the Spring, followed by Fall planting. Note that the projected emissions (Table SH3-1) were based on the assumption that mulching and planting would be performed in the Fall in a one-step operation. Surface roughness impediments to erosion (furrowing), moreover, were neglected in that analysis.

Results of the most probable analysis are presented in Table SH3-2. The slight variations among the factors that account for the emissions reduction achieved by Spring furrowing and mulching (versus Fall

*Available at the Rock Springs District BLM Office.

TABLE SH3-1

SOUTH HAYSTACK PARTICULATE EMISSIONS

	TSP (Tons per Year)			
	1980	1985	1990	EOML
Overburden Removal	382	763	763	638
Ore Loading	75	150	150	125
Truck Dumping	15	30	30	25
Train Loading	1.5	3	3	2.5
Conveying	7.5	15	15	12.5
Coal Storage	0.4	0.8	0.8	0.7
Crushing (Primary)	0.8	1.5	1.5	1.2
Crushing (Secondary)	2.4	4.8	4.8	4
Overburden Dump Disturbance	240	0	0	0
Employee Access Roads	38	32	32	32
Haul Roads (Coal)	15.5	31	31	26
Haul Roads (Overburden)	570	0	0	0
Haul Road Repair	56	56	56	56
Dozers (Overburden Dumps)	56	56	56	56
Wind Erosion	624	453	550	486
Totals	2,084	1,596	1,693	1,466

TABLE SH3-2

MOST PROBABLE PARTICULATE EMISSIONS ESTIMATES FOR SOUTH HAYSTACK

Year	Total Projected Emissions from Table SH3-1 (tons per year)	Reduction of Wind Erosion Emissions from Spring Mulching and Furrowing		Most Probable Emissions (tons per year)	Overall Percent Reduction from Projected Emissions
		Reduction Factor*	Emissions Reduction (tons per year)		
1980**	2,084	0.75	468	1,617	22
1985	1,596	0.75	340	1,256	21
1990	1,693	0.75	412	1,281	24
EOML	1,466	0.75	364	1,101	25

*Percent reduction = 100 x (reduction factor); furrowing factor K = 0.6, 2,000 pounds per acre of mulch assumed to be applied on April 15 of the analysis year.

mulching and no furrowing) result from differences in predominant soil types, climatic factors, and reclamation schedules among the four surface mines.

From the final column of the table, it is apparent that, during the analysis years representing the more typical levels of coal production and mine operation (1985 and 1990), the "most probable" estimates are 21 to 24% less than the more conservative "projected emissions" for the South Haystack mine. The lack of reliability of the most recently published fugitive dust emission factors for coal mines (EPA 1977) and the variability of such factors may be at least as great as the actual range of emissions implied by the figures in Table SH3-2.

Impact on Air Quality

To assess the impact of the mine on the atmospheric environment, estimates must be made of the ambient suspended particulates (SP) concentrations resulting from the mine emissions. To accomplish this, an atmospheric diffusion model has been applied to the mine site. The effect of local emissions is considered in the model both over a long period of time (annual average) and for short-duration exposures (daily averages). All of the emissions from the mine have been added to represent a single source originating across the entire mining area. This area source is considered to be the annual disturbed acreage for modeling of annual averages and 25 acres for modeling of daily averages. This is a reasonable representation considering the wide variations in individual emission points during mining operations. However, for some mines more than 25 acres may be operationally active during any particular 24-hour period. Increasing the size of the area source as much as tenfold would serve to decrease predicted SP concentrations within approximately 1 mile of the mine site but would have little effect further downwind.

Meteorological input to annual average computations consisted of a stability wind rose derived from five years of observations at Rock Springs. Concentrations were calculated for 480 possible weather conditions and weighted by their frequency over a year. The worst-case wind direction was identified as west due to its high frequency of lower wind speeds that result in high ground-level concentrations.

To model worst-case 24-hour concentrations, it was assumed that a wind speed of 4 miles per hour (mph) and a stable atmosphere persisted for 12 hours, followed by a wind speed of 4 mph and a neutral atmosphere persisting for 4 hours, under a northwest wind for the 16-hour period.

No mine impact was assumed for the other 8 hours. Such conditions were derived from five years (1950 to 1954) of Fort Bridger persistence data and represent worst-case meteorology for 24-hour modeling analyses.

Prior to evaluation of the simulated mine results, the reader is reminded of the serious limitations inherent in the state-of-the-art emission factors as well as the uncertainties associated with the modeling of fugitive dust emissions. A complete description of the modeling analysis and inherent uncertainties is presented in Chapter 4 of the Regional Technical Report.

Figures SH3-1 through SH3-4 show the mine-related SP concentrations for worst-case annual and 24-hour averages predicted by the model. Concentrations are shown to decrease rapidly with distance. Annual and 24-hour mine-related concentrations decrease to 10% of maximum values at 1.5 to 2.5 miles and 1.5 to 2 miles downwind of the mine, respectively.

The worst-case SP concentrations shown in Figures SH3-1 through SH3-4 may be scaled to most probable SP values by multiplying each worst-case concentration by the ratio of most probable emissions to worst-case emissions. For example, using the overall percent reduction from projected worst-case emissions (hence concentrations) of 22% for 1980 in Table SH3-2, the worst-case annual concentration of 20 $\mu g/m^3$ and 24-hour concentration of 230 $\mu g/m^3$ at a receptor located 2 miles from the mine would decrease to 16 $\mu g/m^3$ and 179 $\mu g/m^3$, respectively. The decrease in mine-related concentrations implies that projected concentrations greater than the standards for the most probable emissions would not occur as far downwind of the mine as worst-case emissions.

When annual average background particulate values of 16 $\mu g/m^3$ for 1980 and 15 $\mu g/m^3$ for all other years (see the Chapter 4 Regional Technical Report for how they were determined) are added to projected mine-related contributions, total levels are predicted to be greater than the annual primary NAAQS of 75 $\mu g/m^3$ within 1, 1, 1, and 1.5 miles and greater than the annual Wyoming standard of 60 $\mu g/m^3$ within 1.5, 1, 1, and 1.5 miles of the mine for the years 1980, 1985, 1990, and EOML, respectively. Background concentrations are projected to contribute 70% to total TSP levels at 7 to 10.5 miles and 7 to 9 miles downwind from the mine for annual and 24-hour averaging periods, respectively.

If projected mine-related 24-hour SP values and background concentrations of 49 $\mu g/m^3$ for 1980 and 46 $\mu g/m^3$ for all other years are combined, concentrations are predicted to be greater than the 24-hour primary NAAQS of 260 $\mu g/m^3$ within 2, 2, 2, and 2 miles, and greater than the Wyoming standard of 150 $\mu g/m^3$ within 3.5, 3, 3, and 2.5 miles of the mine for the years 1980, 1985, 1990, and EOML, respectively.

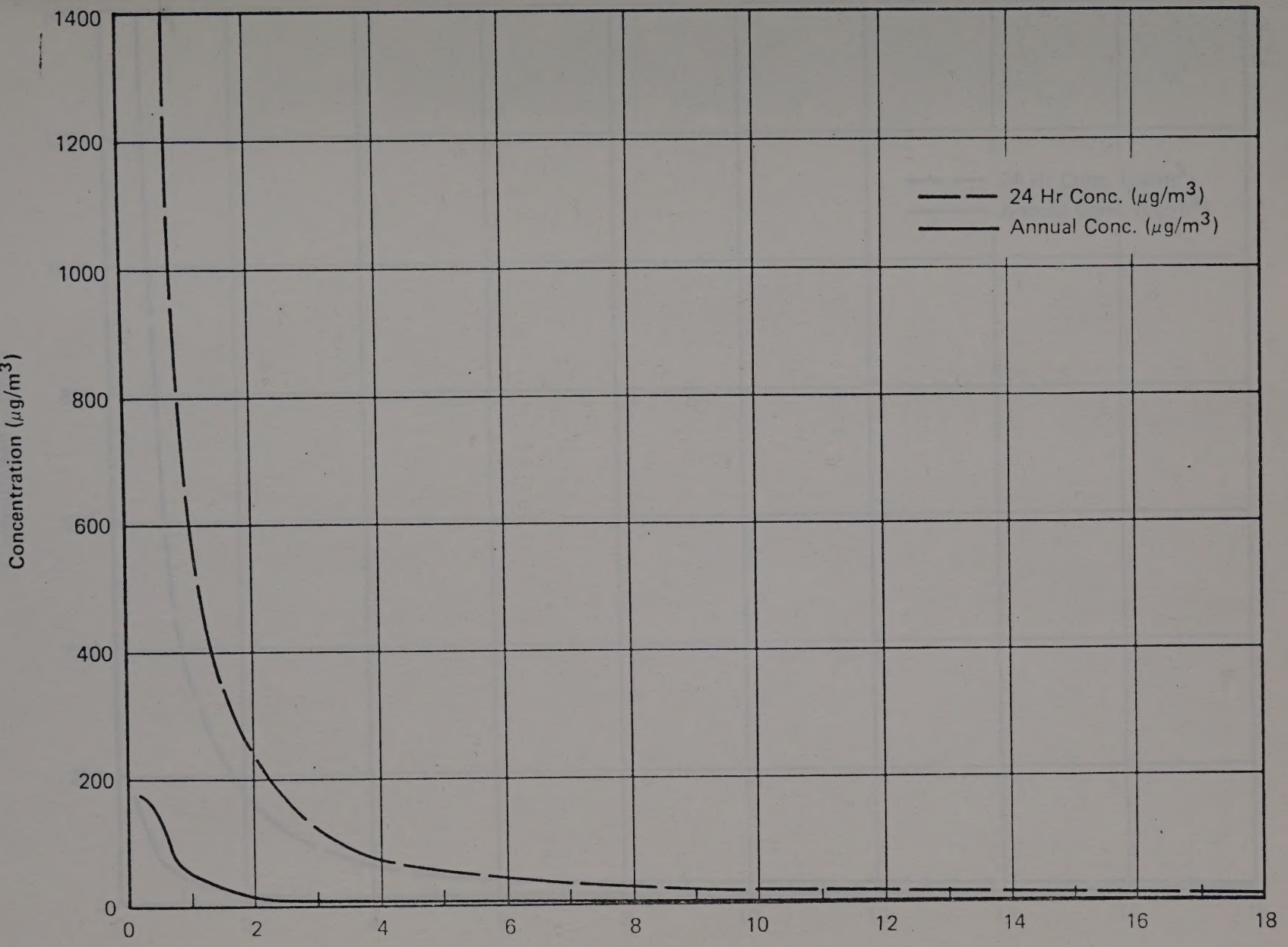


Figure SH3-1

1980 South Haystack SP Concentrations

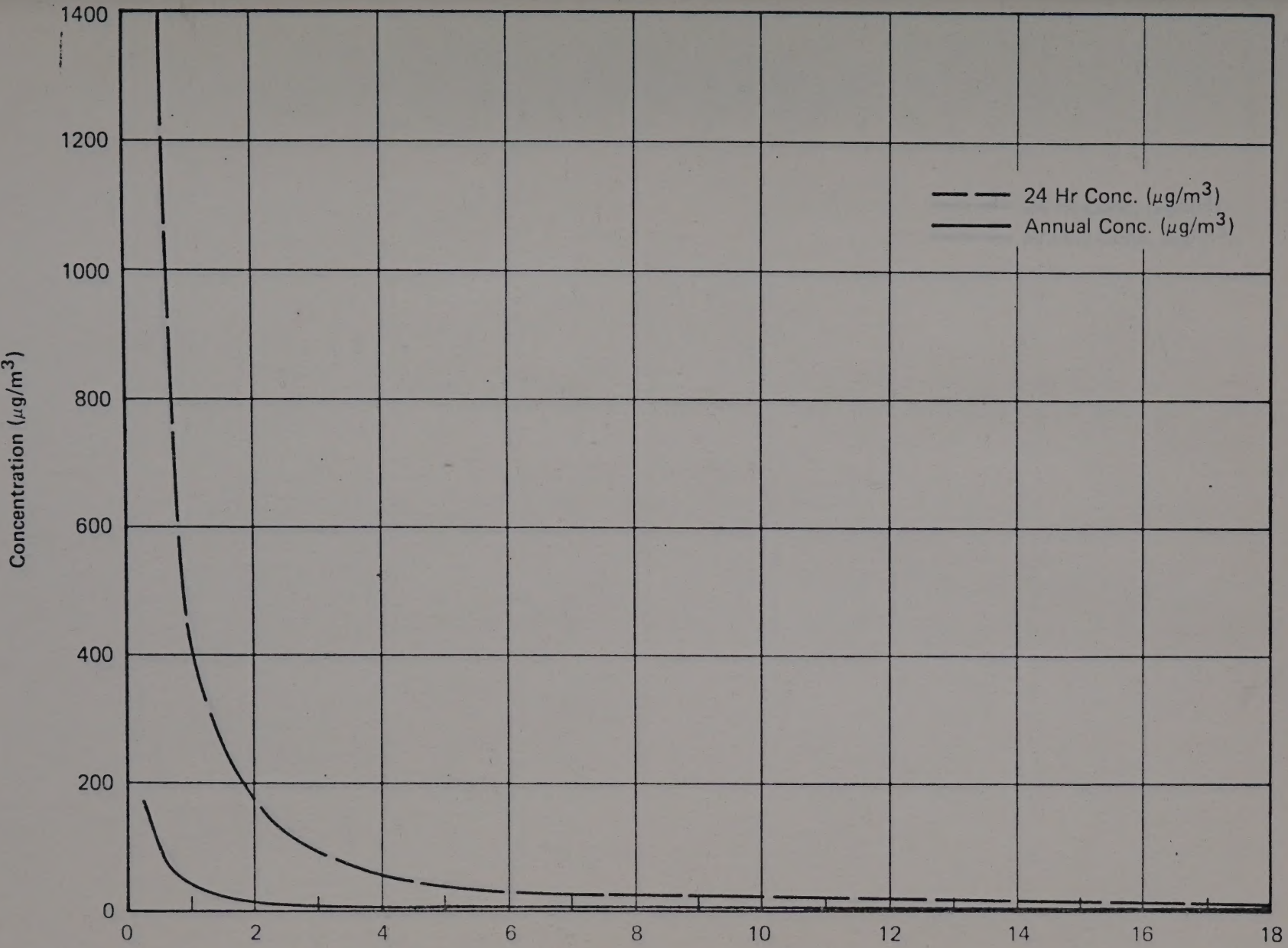


Figure SH3-2

1985 South Haystack SP Concentrations

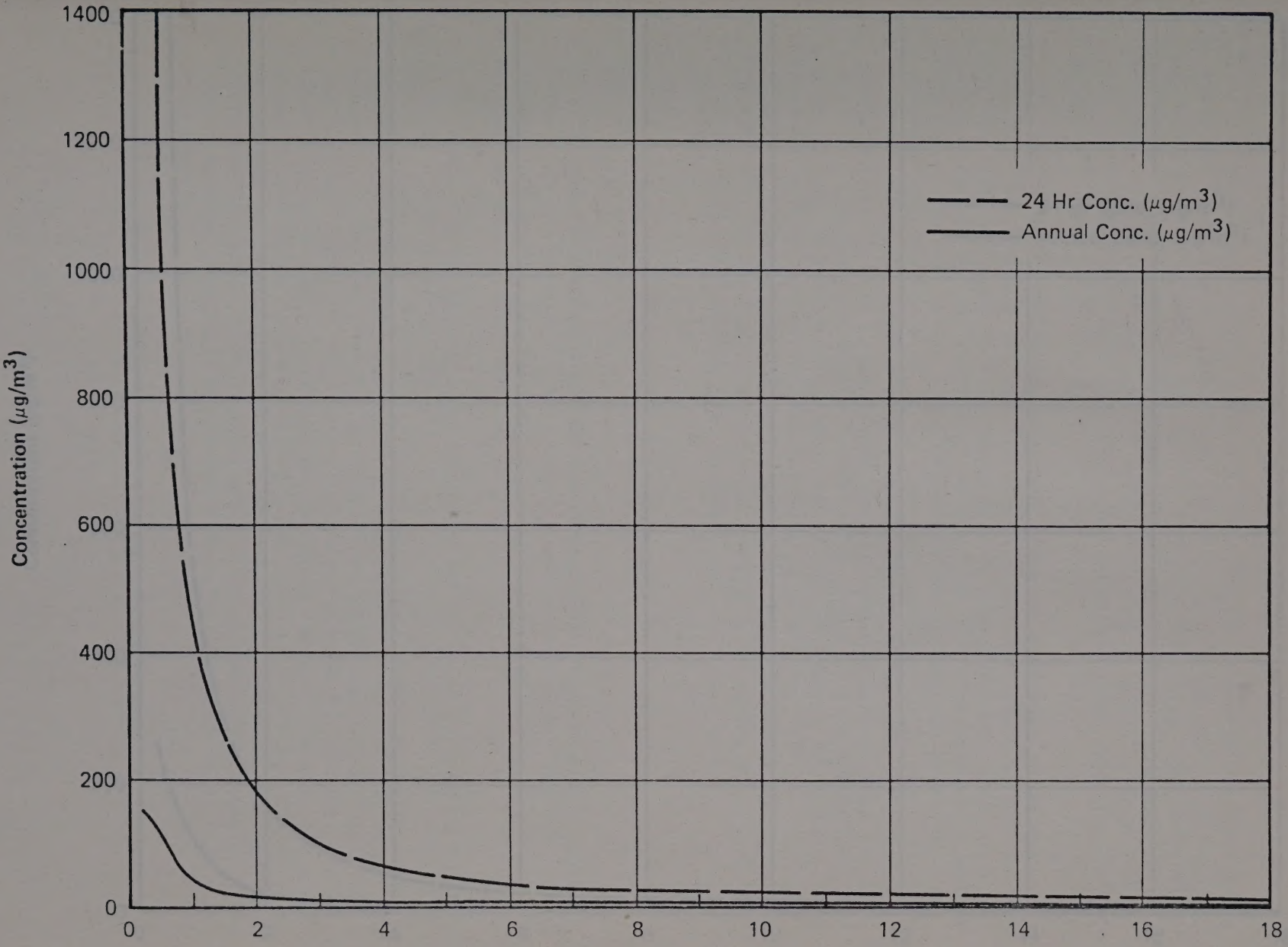
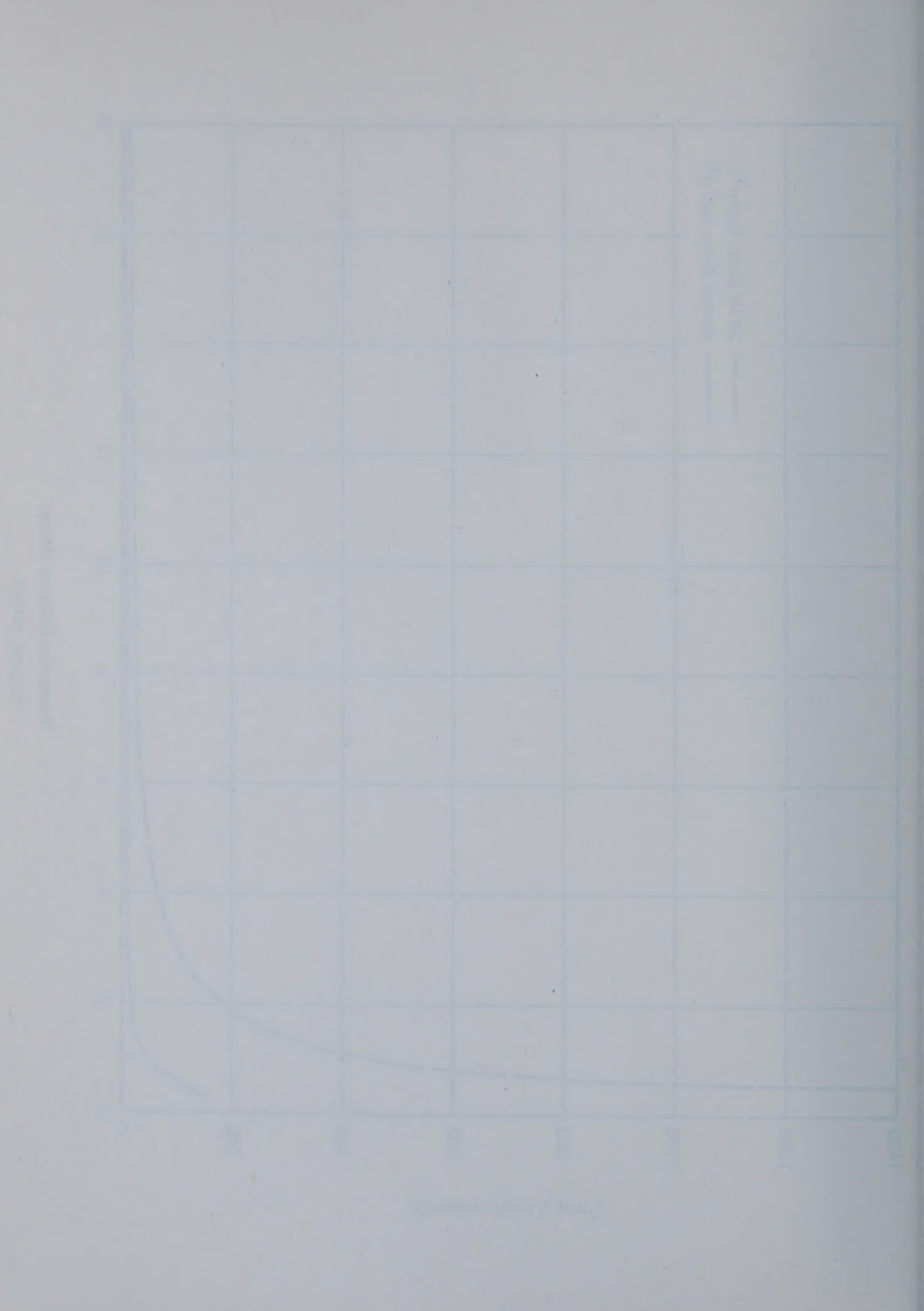


Figure SH3-3

1990 South Haystack SP Concentrations



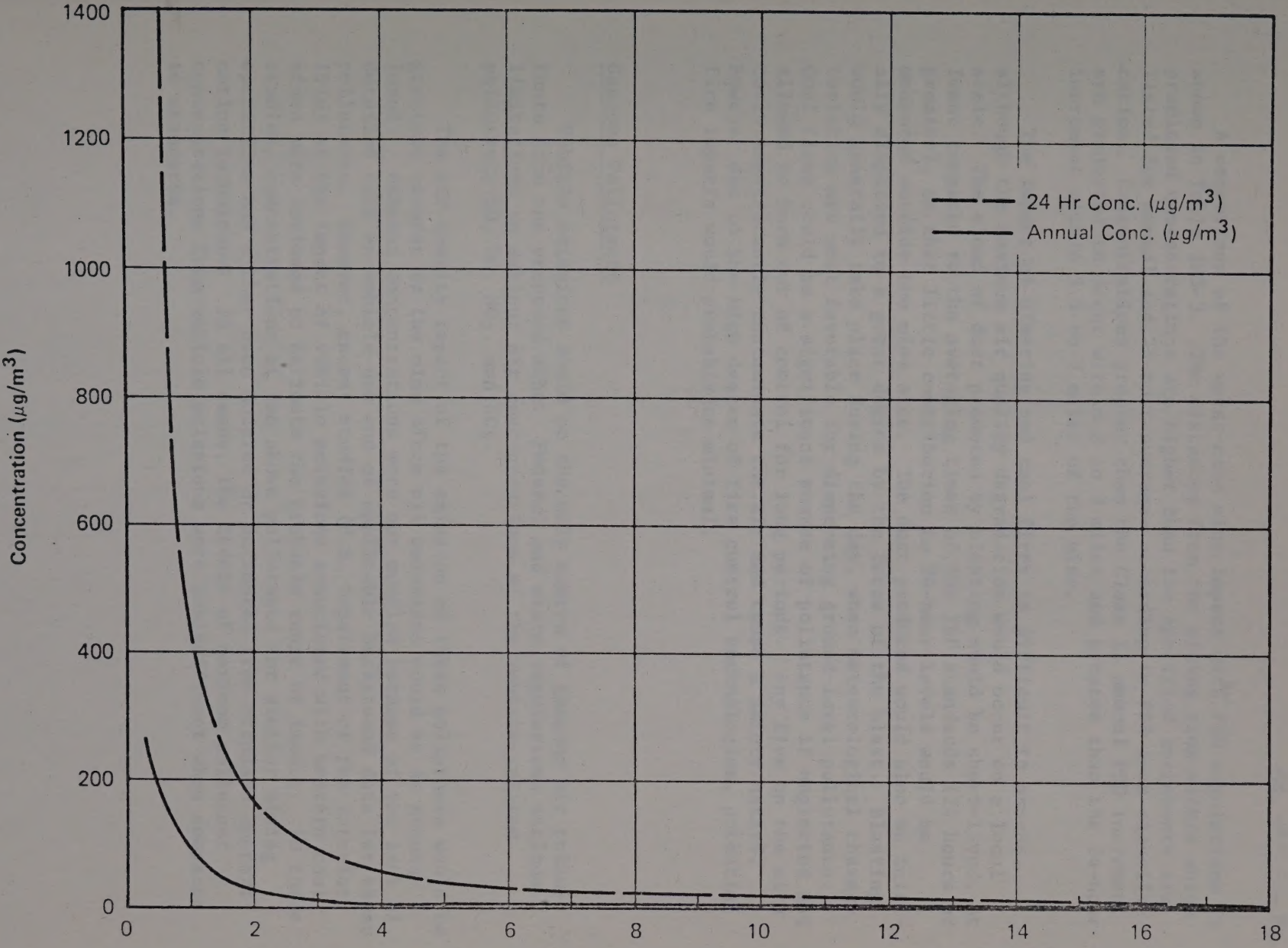


Figure SH3-4

EOML South Haystack SP Concentrations

A comparison of the worst-case mine impact with PSD regulations is shown in Table SH3-3. The distances from the mining area within which predicted concentrations are higher than the specified increments are listed for annual and 24-hour averages according to PSD area classification. Concentrations greater than the Class II annual PSD increment are projected to occur within 2 to 3 miles and greater than the 24-hour increment within 5.5 to 7 miles of the mine.

The impact of blasting and coal fires is difficult to assess, although the maximum air quality degradation would occur on a local scale. The cloud of dust produced by blasting would be short-lived, at least compared to the averaging times of the TSP standards (24 hours or greater), so that little contribution to 24-hour levels would be measured outside the mine site. The dust produced would also be initially dispersed to a great degree by the force of the blast. Blasting would generally take place during the day, when meteorological characteristics are most favorable for dispersing ground-level pollutants. Coal fires could be a significant source of pollutants if neglected and allowed to burn out of control for long periods. Any fire on the site could significantly contaminate the air and cause a safety hazard. However due to the high degree of fire control technologies, potential fire impacts would probably be minimal.

Gaseous Pollutants

Vehicle emissions would be the only source of gaseous air pollutants from the proposed mine. Federal and state regulations include limitations on ambient air concentrations of the vehicle-related pollutants CO, HC, NO_2, and SO_2.

The air quality impact of the emission of these pollutants would be greatest closest to the mine since all emissions would be at ground-level. Ambient concentrations were not modeled because of the lack of detailed data on vehicle use and of applicable background data for these pollutants. However, recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines were reviewed to estimate the probable range of impact. In these studies, concentrations of the above pollutants for similar mining operations had either been modeled or estimated from standard approximation techniques. In all cases, the levels of maximum pollutant concentrations from vehicle emissions were insignificant when compared to standards.

TABLE SH3-3

COMPARISON OF WORST-CASE MODEL PREDICTIONS WITH PSD REGULATIONS

Area Classification	Increment ($\mu g/m^3$)	Annual				Increment ($\mu g/m^3$)	24-Hour			
		Distance within which Predicted Concentrations Are Greater than the Increment (miles)					Distance within which Predicted Concentrations Are Greater than the Increment (miles)			
		1980	1985	1990	EOML		1980	1985	1990	EOML
II	19	2.5	2	2	3	37	7	5.5	6	5.5

Maximum predicted concentrations of CO ranged between 0.02 and 0.44% of the standard. Maximum predicted HC concentrations ranged between 0.88 and 3.44% of the standard. Maximum predicted NO_2 concentrations ranged between 0.60 and 3.0% of the standards. Maximum predicted concentrations of SO_2 ranged between 0.02 and 0.33% of the standards. The values represent predictions at less than one-half mile from the mines. Predictions were significantly less at further distances from the mines. Assuming similar vehicle activity for all western coal mines, the impact of vehicle emissions on ambient concentrations of gaseous pollutants would be minimal and insignificant compared to their respective standards.

Visibility

The ability of an observer to discern distant objects will be constrained by the capacity of the intervening atmosphere to absorb and scatter visible light within one's field of view. These atmospheric extinction properties and their corresponding effect on visibility degradation depend, in a complicated manner, on the optical nature of ambient molecules, aerosols, and particulates within the line of sight. Additional anthropogenic sources of particulates, such as those attributable to fugitive dust emissions, will reduce visibility in the immediate source area. Precise evaluation of the degree of visibility degradation requires a knowledge of several parameters, such as the characteristic particulate number size distribution and the optical properties of particulates within each size range. Such data are generally not available. However, by employing reasonable assumptions an estimate of the visibility impact may be derived using TSP concentrations.

The hypothetical observer is positioned such that one's line of sight is perpendicular to the average wind direction across the plume within a 22.5° sector. For each year considered, the ERTAQ-simulated downwind SP concentrations ($\mu g/m^3$) (given in Figures SH3-1 through SH3-4) are partitioned by mass into both coal and soil fractions based on the annual emissions summary for each mining process. An appropriate number size distribution is assumed for windblown particulates normalized per unit mass concentration. Sixty percent of the TSP is assumed to populate the optically significant size range. Contributions to the total plume visibility degradation are computed for each fraction using its optical properties and scaling normalized results by the TSP concentrations. Results are presented for each year assuming background visibilities of both 40 miles and 7 miles, the latter characteristic of weather induced visibility degradation. A complete technical description is given in Chapter 4 of the Regional Technical Report.

Using this technique, visibilities are computed downwind from the source. Results for worst-case 24-hour SP concentrations for the years 1980, 1985, 1990, and EOML are shown in Table SH3-4. Also given are the mass fractions of the total TSP for coal and soil for each year. For 1980, the visibility of an observer at 1 mile downwind would be approximately 39.5 miles assuming a background visibility of 40 miles. In general, visibility will increase with downwind distance from the mine. At 5 miles downwind the visibility will be 39.7 miles, and at 10 miles it will reach 39.8 miles. The corresponding values, assuming a background visibility of 7 miles, are 6.9 miles, 6.9 miles, and 7 miles, respectively. Additional years are given in the table.

TABLE SH3-4

ACROSS PLUME VISIBILITY DEGRADATION FOR THE PROPOSED SOUTH HAYSTACK MINE

Year	Mass Fraction		Visibility Downwind					
			Background 40 Miles			Background 7 Miles		
	Coal	Soil	1 Mile	5 Miles	10 Miles	1 Mile	5 Miles	10 Miles
1980	6	94	39.5	39.7	39.8	6.9	6.9	7.0
1985	13	87	39.4	39.7	39.8	6.9	6.9	7.0
1990	13	87	39.3	39.7	39.8	6.9	6.9	7.0
EOML	12	88	39.4	39.8	39.8	6.9	6.9	7.0

AIR QUALITY MITIGATING MEASURES NOT INCLUDED IN THE PROPOSED ACTION

The measures that will be taken to reduce the impact of the proposed mining activities must be enforceable under state and federal laws and regulations. Appropriate laws include the Clean Air Act of 1970 (U.S. Congress 1970), the Clean Air Act Amendments of 1977, (U.S. Congress 1977), the Wyoming Air Quality Standards and Regulations (Wyoming Statutes 1972), and the Surface Mining Control and Reclamation Act of 1977 (PL 95-87).

Measures Required by Federal Agencies

Office of Surface Mining

Before approval of mining and reclamation plans is granted, the mine plan must demonstrate performance standards that ensure removing the amount maximum of the coal resource; restoring the condition of the mined land; stabilizing surface areas to control erosion and, hence, emissions of fugitive dust; removing topsoil; restoring topsoil; and establishing a permanent vegetative cover for post-mining land-use.

Bureau of Land Management (BLM) and U.S. Geological Survey (USGS)

Enforceable procedures have been provided to ensure that adequate measures are taken during exploration of surface mining of federal coal to avoid, minimize, or correct damages to the environment, including air. Also implemented by the BLM and USGS are procedures to conduct leasing and subsequent management of federal coal, as well as regulations governing operations for discovering, testing, developing, mining, and preparing federal coal.

Environmental Protection Agency (EPA)

Mandated by the Clean Air Act of 1970, Wyoming is responsible for ensuring air quality within its borders and for specifying achievement and maintenance strategies. While the ultimate authority for enforcing the air pollution regulations rests with the EPA, this authority is only exercised when enforcement by the state environmental quality departments fails.

State and Local Agencies

Wyoming Department of Environmental Quality (DEQ)

To ensure that the ambient air quality standards will not be exceeded, the Wyoming DEQ must approve the construction and/or modification and the operation of any facility that will have an impact on air quality (Section 21, Wyoming Statutes 1972). The approval process involves an evaluation of the expected impact on the ambient air quality. The Wyoming DEQ, Division of Air Quality, also generally requires the establishment of a monitoring program to gather data concerning the ambient air quality as a result of the operation of the new or modified facility.

The Air Quality Division is legally required to ensure maintenance of the Air Quality Standards; and, therefore, they are required to ensure that mitigating measures are practiced. This is done as a matter of course through the permit and enforcement procedures. For instance, if the ambient monitoring system reveals that fugitive dust is causing excessive ambient TSP concentrations, the Wyoming DEQ could require any of the following control measures (Section 14, Wyoming Statutes 1972):

> "The emission of fugitive dust shall be limited by all persons handling, transporting, or storing any material to prevent unnecessary amounts of particulate matter from becoming airborne to the extent that ambient air standards described in these regulations are exceeded. Control measures described as follows or any equivalent method shall be considered appropriate for such control.
>
> 1) use, where possible, of water or chemicals for control of dust in the demolition of existing buildings, or structures, construction operations, the grading of roads or the clearing of land;
>
> 2) application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which can give rise to airborne dusts;
>
> 3) installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials; adequate containment methods shall be employed during sandblasting or other similar operations;
>
> 4) covering, at all times when in motion, open-bodied trucks, transporting materials likely to give rise to airborne dust;
>
> 5) conduct of agricultural practices such as tilling of land, application of fertilizers, etcetera, in such a manner as to prevent dust from becoming airborne;
>
> 6) the paving of roadways and their maintenance in a clear condition;

7) the prompt removal of earth or other material from paved streets onto which earth or other material has been transported by trucking or earth moving equipment, erosion by water, or other means."

These control measures are further enforced by the Clean Air Act Amendments of 1977. The Prevention of Significant Deterioration regulations (PSD) as mandated by the Amendments require specific control measures be implemented at a new facility or on modification of an existing source. If this facility is located in an area of air quality standard nonattainment (NA) status or is predicted to significantly impact an NA area, even more stringent regulations and control procedures apply. For example, if the new source will operate in an area of recorded TSP violations, through the permitting process, implementation of a monitoring program, Best Available Control Technology, Lowest Achievable Emission Rates, and/or the Offset Policy may apply. The Offset Policy mandates that emissions from existing sources in the region must be reduced in an amount more than sufficient to offset emissions from the new sources.

Applicant Committed Measures

There are no air quality or climate mitigative measures committed subsequent to the filed mine plan. Since federal and state regulations (mining and reclamation, emissions, and air quality maintenance) require that best available control measures be included in the mine plans, they have been considered in the impact analysis (Chapter 3).

Monitoring and Research Programs

To develop a base for future mine impact analyses and ascertain attainment or nonattainment of Air Quality Standards, the operators would be required to provide a monitoring program. This would be for the purpose of determining both background concentration levels and total ambient levels (background plus mining impact). Therefore, the monitoring program would measure TSP levels both in the predominant upwind and downwind directions. As reclamation is accomplished, the compliance officers (state and federal) would conduct periodic inspections of mining areas to ensure reclamation is accomplished in accordance with an approved reclamation plan.

UNAVOIDABLE ADVERSE IMPACTS FOR SOUTH HAYSTACK

For the South Haystack mine, no optional mitigative measures are proposed. All measures proposed in the mining plans are already included in the analysis. Therefore, all reductions in concentrations associated with mitigation have already been considered in the impacts reported in Chapter 3. Unavoidable adverse impacts are then equivalent to impacts discussed in Chapter 3.

Impacts on Air Quality

When annual average background particulate values of 16 $\mu g/m^3$ for 1980 and 15 $\mu g/m^3$ for all other years (see Chapter 4 of the Regional Technical Report* for how they were determined) are added to projected mine-related contributions, the annual primary NAAQS of 75 $\mu g/m^3$ is predicted to be exceeded (in the worst case) within 1, 1, 1, and 1.5 miles of the active site; and the annual Wyoming standard of 60 $\mu g/m^3$ is predicted to be exceeded within 1.5, 1, 1, and 1.5 miles of the active site for the years 1980, 1985, 1990, and EOML, respectively (see Table SH5-1).

If projected mine-related 24-hour SP values and background concentrations of 49 $\mu g/m^3$ for 1980 and 46 $\mu g/m^3$ for all other years are combined, the 24-hour primary NAAQS of 260 $\mu g/m^3$ is predicted to be exceeded within 2, 2, 2, and 2 miles of the active site; and the Wyoming standard of 150 $\mu g/m^3$ is predicted to be exceeded within 3.5, 3, 3, and 2.5 miles of the active site for the years 1980, 1985, 1990, and EOML, respectively. (These projections are based on worst-case meteorological conditions.)

A comparison of the worst-case mine impact with PSD regulations is shown in Table SH5-2. The distances from the mining area within which the specified regulations are predicted to be exceeded are listed for annual and 24-hour averages according to PSD area classification.

The predicted annual and 24-hour TSP concentrations discussed above and presented in Tables SH5-1 and SH5-2 are worst-case mine impacts. In addition, twenty-four hour impacts are based on worst-case meteorological conditions. Annual impacts assume a mining and reclamation schedule such that for approximately nine months of the year there is unreclaimed land subject to wind erosion. The "most probable" levels of emissions have been calculated based on these factors (see Chapter 3 for a more detailed discussion). The most probable emissions for the South Haystack mine at EOML may be 75% of the worst-case emissions.

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TABLE SH5-1

DISTANCES FROM ACTIVE MINE SITE WITHIN WHICH AMBIENT AIR QUALITY STANDARDS FOR TSP ARE PREDICTED TO BE EXCEEDED

Averaging Time	Standard ($\mu g/m^3$)	Year			
		1980	1985	1990	EOML
24-hour	150*	3.5 miles	3 miles	3 miles	2.5 miles
	260**	2 miles	2 miles	2 miles	2 miles
Annual	60*	1.5 miles	1 mile	1 mile	1.5 miles
	75**	1 mile	1 mile	1 mile	1.5 miles

*Wyoming
**NAAQS

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TABLE SH5-2

DISTANCES FROM ACTIVE MINE SITE WITHIN WHICH
PSD REGULATIONS FOR TSP
ARE PREDICTED TO BE EXCEEDED

Averaging Time	Standard* ($\mu g/m^3$)	Year			
		1980	1985	1990	EOML
24-hour	37	7 miles	5.5 miles	6 miles	5.5 miles
Annual	19	2.5 miles	2 miles	2 miles	3 miles

*Area II classification

In addition to the sources of fugitive dust already listed, two other potential sources of significant particulate emissions are associated with the South Haystack mine: blasting and coal fires. The impact of these two sources is difficult to assess although the maximum air quality degradation would occur on a local scale. The cloud of dust produced by blasting would be short-lived, at least compared to the averaging times of the TSP standards (24 hours or greater), so that little contribution to 24-hour levels would be measured outside the mine site. Coal fires could occur in spite of mitigating measures taken to prevent them. If neglected and allowed to burn out of control for long periods, they could be a significant source of pollutants. Any fire on the site could significantly contaminate the air and cause a safety hazard. However, due to a high degree of fire control technologies, potential fire impacts would probably be minimal.

If reclamation fails because of a natural catastrophe and the area disturbed by mining operations is not revegetated, particulate emissions could be increased over all predicted emission levels presented in this report, although the magnitude of this increase is unknown.

Mine-related NO_x and SO_2 emissions are expected to be insignificant, as discussed in Chapter 4 of the Regional Statement Component; therefore, ambient pollutant concentrations have not been predicted.

Gaseous Pollutants

Recent studies (U.S. Department of the Interior 1976) of the impact of vehicle emissions associated with western coal mines were reviewed to estimate the probable range of impact. Maximum predicted concentrations of CO ranged between 0.02 and 0.44% of the standard. Maximum predicted HC concentrations ranged between 0.88 and 3.44% of the standards. Maximum predicted NO_2 concentrations ranged between 0.60 and 3.0% of the standards. Maximum predicted concentrations of SO_2 ranged between 0.02 and 0.33% of the standards. The values represent predictions at less than one-half mile from the mines. Predictions were significantly less at further distances from the mines.

Visibility

For 1980, the visibility of an observer at 1 mile downwind would be approximately 39.5 miles, assuming a background visibility of 40 miles. In general, visibility will increase with downwind distance from the mine. At 5 miles downwind the visibility will be 39.7 miles, and at 10 miles it will reach 39.8 miles. The corresponding values, assuming a background visibility of 7 miles, are 6.9 miles, 7 miles, and 7 miles, respectively (see Table SH5-3).

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TABLE SH5-3

ACROSS PLUME VISIBILITY DEGRADATION FOR SOUTH HAYSTACK

Year	Visibility Downwind					
	Background 40 Miles			Background 7 Miles		
	1 Mile	5 Miles	10 Miles	1 Mile	5 Miles	10 Miles
1980	39.5	39.7	39.8	6.9	6.9	7
1985	39.4	39.7	39.8	6.9	6.9	7
1990	39.3	39.7	39.8	6.9	6.9	7
EOML	39.4	39.8	38.8	6.9	6.9	7

RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY FOR SOUTH HAYSTACK

Short-term use of the environment (mining operations) will produce impacts that include generation of fugitive dust and gaseous pollutants (from vehicles) and a reduction in visibility.

The air pollution caused by the mine will be primarily a short-term phenomenon because most air quality impacts will cease when active mining and reclamation are completed. Short-term air quality impacts include fugitive dust generated by the mining activities, particulate emissions associated with blasting and coal fires, and reductions in visibility.

Air pollution from vehicle exhausts and fugitive dust emissions from access roads after the completion of mining will depend on the subsequent use of the land. Access to the property will have been established. Continued use of unpaved access roads could result in continuing emissions of fugitive dusts from wind erosion and gaseous pollutants from vehicle exhausts. If these impacts continue after EOML, they will be long-term impacts. Since subsequent land use is not known, the extent of these impacts cannot be quantified but is expected to be minimal. Minimal concentrations are anticipated because concentrations predicted during mine life based on traffic associated with mining operations is insignificant when compared to national standards. Traffic volume would have to increase significantly over that estimated at peak mining operations to substantially affect ambient concentrations in the future. Therefore, the short-term use of the natural resources (coal) is not expected to significantly affect long-term maintenance of air quality.

The proposed short-term use of the environment does not foreclose other additional long-term uses of the environment. That is, air quality will not be degraded after EOML, foreclosing the development of other industrial sources in the area (due to PSD allowable increments) or altering the air quality from its presently rural character.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES FOR SOUTH HAYSTACK

Most air quality impacts associated with the South Haystack mine will be reversed when the land is reclaimed and returned to an equivalent of the pre-existing vegetative cover and general contours. The only long-term air quality impacts anticipated are those resulting from continued use of unpaved access roads after the project has been completed or halted. Since use of these roads could be stopped by blocking access or reclaiming roadbeds, no irreversible air quality impacts are predicted.

Irreversible meteorological impacts are anticipated. Local, insignificant changes in the microclimatology of the area would result from the redistribution of the surface material at the mine. (See Chapter 2 of the Regional Technical Report.*) Changes in contours and surface characteristics would irreversibly alter the wind field and surface heating of the air. For example, the divergent or convergent patterns of the surface winds would change according to the changes in small-scale surface contours. Changes in the composition of topsoil and vegetation could alter the absorption and radiation of solar heat.

Irretrievable air quality impacts will occur. The loss of good air quality for the period of the project cannot be retrieved. During the life of the project, TSP standards may be exceeded and visibility reduced in the immediate vicinity of the project.

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